National Highways & Infrastructure Development Corporation Limited

Undertaking of
(Ministry of Road Transport & Highways)
Government of India

Request for Proposal (RFP)

For

"Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt. - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP"

March, 2020

National Highways and Infrastructure Development Corporation Ltd.
4, Parliament Street, PTI Building, New Delhi-110 001

National Highways & Infrastructure Development Corporation Limited,
(A Govt. of India Undertaking)
3rd Floor, PTI Building, 4 Parliament Street,
New Delhi - 110001

Contract Agreement No.: NHIDCL/MMLP/ Phase-1/ Package-3/2020

CONTENTS

Issued to (Name of Tenderer):_____
Address of Tenderer: _____
Signature of Officer Issuing the Documents: _____
Designation: _____
Date of Issue: _____

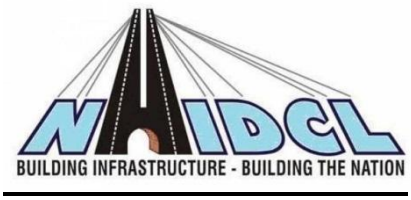
E-mail: yogesh.chandra15@gov.in
Phone No.: - 01123461617

Development of Multimodal Logistics Park at Jogighopa and External Trunk Connectivity Infrastructure to the Multimodal Logistics Park (MMLP) site at Jogighopa

"**Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP"**

PART – 1

TECHNICAL BID



National Highways & Infrastructure Development Corporation Limited,
(A Govt. of India Undertaking)
3rd Floor, PTI Building, 4 Parliament Street,
New Delhi - 110001

Section – 1

NOTICE INVITING TENDER & INSTRUCTIONS TO TENDERERS

SECTION 1
NOTICE INVITING TENDER

NIT NO.: **NHIDCL/MMLP/ Phase-1/ Package-3/2020**

Name of the Work: "**Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP"**

National Highways & Infrastructure Development Corporation Limited (NHIDCL) represented by its Managing Director now invites bids from eligible contractors for the following project:

State	Name of work	Estimated cost (Rs. Cr)	Completion Period	Maintenance Period
Assam	"**Earthwork in formation, Road work, construction of bridges, blanketing, P. Way linking works including supply of P. Way fittings and track ballast in connection with construction of Railway siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt. - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP"**	22.45	16 Months	24 (months) / 2 Years from the Date of Completion Certificates

The complete BID document can be viewed / downloaded from official website of NHIDCL http://www.nhidcl.com and www.eprocure.gov.in from 17.03.2020to 16.04.2020 (upto11.00 Hrs. IST). Bidder must submit its Technical and Financial bid at [http://eprocure.gov.in] on or before 16.04.2020 (upto11.00 hours IST). Bids received online shall be opened at 11.00 AM on 17.04.2020

Bid through any other mode shall not be entertained. However, EMD, document fee, Power of Attorney and Joint Bidding Agreement etc. shall be submitted physically by the Bidder on or before 16.04.2020 (at 11.00 hours IST), Please note that the **National Highways & Infrastructure Development Corporation Limited (NHIDCL)** reserves the right to accept or reject all or any of the BIDs without assigning any reason whatsoever.

The Schedule for bidding process is as follows:

Sr. No.	Event Description	Date
1	Invitation of RFP (NIT)	17.03.2020
2	Last date for receiving queries	03.04.2020
3	Pre-BID meeting at venue 2.11.4 (i)	12:15 PM on 07.04.2020
4	Authority response to queries latest by	08.04.2020
5	Last date of Request for BID Document	Up to 10.30 AM on 16.04.2020
6	BID Due Date	Up to 11.00 AM on 16.04.2020
7	Physical Submission of EMD/POA etc.	Up to 11.00 AM on 16.04.2020
8	Opening of Technical BIDs at venue 2.11.4 (i)	Up to 11.00 AM on 17.04.2020
9	Declaration of eligible / qualified Bidders	To be intimated later
10	Opening of Financial BID	To be intimated later
11	Letter of Acceptance (LOA)	To be intimated later
12	Return of signed duplicate copy of LOA	To be intimated later
13	Validity of BID	120 days
14	Submission of Performance Security (PS) and Additional Performance Security (APS), if any	As per document
15	Signing of Agreement	As per document
16	**Estimated Cost** (Approx.)	Rs.22.45 Crore
17	**EMD**	Rs.12.72 Lakhs (Rupees Twelve Lakhs Seventy-Two Thousand Only)

Officer In-charge
YC Srivastava
GM (Tech.)
NHIDCL
PTI Building, 3rd Floor,
4 Parliament Street,
New Delhi-110001
Phone/ Fax 011-23461612
E-mail: yogesh.chandra15@gov.in

DISCLAIMER

The information contained in this Request for Proposal document (the "RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of the Authority or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

This RFP is not an Agreement and is neither an offer nor invitation by the Authority to the prospective bidders or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in making their financial offers (BIDs) pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the Authority in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This RFP may not be appropriate for all persons, and it is not possible for the Authority, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in the Bidding Documents, especially the [Feasibility Report], may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this RFP and obtain independent advice from appropriate sources.

Information provided in this RFP to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Authority accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

The Authority, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way for participation in this BID Stage.

The Authority also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP. The Authority may in its absolute discretion, but without being under any

obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this RFP.

The issue of this RFP does not imply that the Authority is bound to select a Bidder or to appoint the Selected Bidder JV or Contractor, as the case may be, for the Project and the Authority reserves the right to reject all or any of the Bidders or BIDs without assigning any reason whatsoever.

The Bidder shall bear all its costs associated with or relating to the preparation and submission of its BID including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the Authority or any other costs incurred in connection with or relating to its BID. All such costs and expenses will remain with the Bidder and the Authority shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the BID, regardless of the conduct or outcome of the Bidding Process.

INSTRUCTIONS TO BIDDERS

GENERAL

1.1 A brief of Jogighopa MMLP is enclosed at **Enclosure-I**.

1.2 Bids for the Road work and building works have been invited as Package-I and II. The present tender is for the construction and development of Railway line i.e. Package-III.

1.3 Online Tenders are invited by NHIDCL, an Undertaking under the Ministry of Road Transport and Highways, from working contractors (including contractors who have executed works within the last five years reckoned from the date of opening of tenders) of Railways, CPWD, MES, DOT, NHIDCL, State PWD or any other Central / State Government Undertaking Municipal Body, Autonomous Body or Public Ltd. Co. listed on BSE/NSE for the work of "**Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt - Bongaigaon, Assam from Ch. 00 to 3760- Package III of MMLP"**

1.4 The bidders including individual or any of its JV member, who are either having 2 (two) on-going EPC project(s) or on-going project(s) worth of Rs. 500 Cr. (Awarded Cost), whichever is more, as on date of bid submission, shall not be eligible to bid for this project and the bidder shall not be awarded more than 2 (two) packages (total cost of Rs 500 Cr.) for current bidding process in NHIDCL on EPC basis.

1.5 The work is estimated to cost Rs.22.45 Crore (Approx.). This estimate, however, is given merely as a rough guide.

1.6 Time for Completion: The time allowed for completion of the work will be **16 (Sixteen)** months from the 15th day after the date of issue of Letter of Acceptance or from the first day of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the Tender Documents.

1.7 Brief Scope of Work

(i) Dismantling, Stacking, Disposal of Released Track materials and Revenue generation by sale of salvaged items
(ii) Earth work in formation including mechanical compaction
(iii) Blanketing on formation including mechanical compaction
(iv) P. Way work including supply of Rail, PSC Sleeper, Turnouts, Fittings & Ballast
(v) Construction of VUP

1.8 Availability of Site: 80% site is available to start the work.

QUALIFICATION CRITERIA TO BE SATISFIED

The Qualification Criteria to be satisfied is given at Annexure I enclosed.
Information whether Joint Ventures are allowed and whether category of work is Normal or Large, is given in Annexure I enclosed.

FORMAT AND CHECK LIST FOR SUBMISSION OF INFORMATION ON QUALIFICATION CRITERIA

Other than Joint Ventures

The tenderer shall furnish a Letter of Transmittal as given in ANNEXURE II A enclosing the documents mentioned therein/listed in Para 7(a) of Annexure I

Joint Ventures (For Large Works): Not Applicable.

Joint ventures (For Normal Works): Not Applicable.

CONTENTS OF TENDER DOCUMENT

Each set of Tender or Bidding Document will comprise the documents listed below and addenda issued in accordance with Para 7:

PART – 1: - Technical Bid

Section-1:	Notice Inviting Tender and Instructions to Tenderers
Section-2:	Tender and Contract Form
Section-3:	Special Conditions of Contract
Section-4:	Special Conditions for Supply of Ballast
Section-5:	Special Conditions for Thermit Welding
Section-6:	Schedule A to F
Section-7:	Scope of work & payment schedule
Section-8:	Technical Specifications and QAP
Section-9:	Drawings, if any
Section-10:	General Conditions of Contract (Read with up to date correction Slip)

PART – 2: - Financial Bid

Section-11:	Schedule of Quantities (Bill of Quantities)

ISSUE OF TENDER DOCUMENT

5.1 The complete BID document can be viewed / downloaded from official website of NHIDCL http://www.nhidcl.com and www.eprocure.gov.in from 17.03.2020to 16.04.2020 (upto11.00 Hrs. IST). Bidder must submit its Technical and Financial bid at [http://eprocure.gov.in] on or before 16.04.2020 (upto11.00 hours IST). Bids received online shall be opened at 11.00 AM on 17.04.2020.

5.2 Bid through any other mode shall not be entertained. However, EMD, document fee, Power of Attorney and Joint Bidding Agreement etc. shall be submitted physically by the Bidder on or before 16.04.2020 (at 11.00 hours IST). Please note that, The Bidders shall also submit the cost of RFP document in form of Demand Draft for Rs. 10,000/- (Rupees Ten Thousand Only) issued from a scheduled Bank in India in favour of Managing Director, National Highways and Infrastructure Development Corporation Limited payable at New Delhi or can be deposited online (RTGS/NEFT/Other online mode) to the NHIDCL's Bank account as specified in Appendix-VII. A copy of payment receipt (RTGS/NEFT/Other online mode) must be submitted. The National Highways & Infrastructure Development Corporation Limited (NHIDCL) reserves the right to accept or reject all or any of the BIDs without assigning any reason whatsoever. NHIDCL's Bank Details for submission of Document fee and Bid Security:

Sr. No.	Particulars	Details
1.	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2.	Beneficiary Bank Account No.	90621010002610
3.	Beneficiary Bank Branch Name and Address	Syndicate Bank, Transport Bhawan, 1st Parliament Street, New Delhi-110001
4.	Beneficiary Bank Branch IFSC	SYNB0009062
5.	Swift Code (For Foreign Bidders)	SYNBINBB126

5.3 A prospective tenderer requiring any clarification on the Tender Document may notify **Shri Yogesh Chandra Srivastava, GM (Technical)** (The official nominated for this purpose) in writing or by telefax/cable at the address "National Highways & Infrastructure Development Corporation Limited, (A Govt. of India Undertaking), 3rd Floor, PTI Building, 4 Parliament Street, New Delhi – 110001", E-mail: yogesh.chandra15@gov.in

PRE-BID MEETING

The tenderer or his official representative in invited to attend a pre-bid meeting which will take place at the office of General Manager (Technical), National Highways & Infrastructure Development Corporation Limited, (A Govt. of India Undertaking), 3rd Floor, PTI Building, 4 Parliament Street, New Delhi – 110001 at 12:15 PM on 07.04.2020.

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

1.4 The tenderers are required to submit any questions/query in writing or by email so as to reach the **G.M. (Technical),** National Highways & Infrastructure Development Corporation Limited, (A Govt. of India Undertaking), 3rd Floor, PTI Building, 4 Parliament Street, New Delhi – 110001, E-mail: yogesh.chandra15@gov.in

1.5 Reply to quarries including prebid meeting shall be uploaded on www.eprocure.gov.in. Any notifications of the tender document listed in para 4.1 which may become necessary as a result of the Pre-bid meeting shall be made exclusively through the issue of an addendum / corrigendum pursuant to para 7.2

1.6 Non-attendance at the Pre-bid meeting will not be a cause for disqualification of a tenderer.

AMENDMENT OF TENDER DOCUMENT

7.1 Before the deadline for submission of tenders, the tender document may be modified by NHIDCL by issue of addendum/corrigendum.

7.2 Addendum/corrigendum, if any, will be hoisted on website only and shall become a part of tender document. All tenderers are advised to see website for addendum/corrigendum to the tender document before submission of their tender.

7.3 To give prospective tenderers reasonable time in which to take the addenda/ corrigenda into account in preparing their tenders, extension of the deadline for submission of tenders may be given as considered necessary by NHIDCL.

TENDER VALIDITY

8.1 The Tender shall be valid for a period of 120 days from the due date for submission of Tender or any extended date as indicated in sub Para below.

8.2 In exceptional circumstances, prior to the expiry of the original time limit for Tender Validity, the Employer may request that the tenderers may extend the period of validity for a specified additional period. The request and the tenderer's response shall be made in writing. A tenderer may refuse the request without forfeiting his Earnest Money. A tenderer agreeing to the request will not be required or permitted to modify his Financial

Bid but will be required to extend the validity of the Earnest Money for the period of the extension.

EARNEST MONEY

9.1 The Tender should be accompanied by Earnest Money of Rs. 12.72 Lakhs (Rupees Twelve Lakhs Seventy-Two Thousand Only) in any of the forms given below: - Banker's Cheque / Pay Order/ Demand Draft drawn on any Scheduled Bank payable at New Delhi, in favor of NHIDCL.

9.2 Any Tender not accompanied by Earnest Money or the Tender accompanied by Earnest Money not in an acceptable form shall be rejected by the Employer as non-responsive.

9.3 Refund of Earnest Money: After evaluation of the Financial Bids, the Earnest Money of unsuccessful tenderers will be returned within 14 days of the opening of financial bids. .

9.4 The Earnest Money is liable to be forfeited;

(a) if after bid opening during the period of bid validity or issue of Letter of Acceptance, whichever is earlier, any tenderer
  (i) withdraws his tender or
  (ii) makes any modification in the terms and conditions of the tender which are not acceptable to the Employer.

(b) in case any statement/information/document furnished by the tenderer is found to be incorrect or false.

(c) in the case of a successful tenderer, if the tenderer
  (i) fails to furnish the Performance Guarantee within the period specified under Clause 1 of "Clauses of Contract".
  (ii) fails to commence the work **without valid reasons** within 15 days after the date of issue of Letter of Acceptance or from the date of handing over of the site, whichever is later.

9.5 In case of forfeiture of E.M.D. as prescribed hereinabove, the tenderer shall not be allowed to participate in the retendering process of the work.

ALTERNATIVE PROPOSALS BY THE TENDERERS

The Tenderers shall submit offers which comply strictly with the requirements of the Tender Document. Alternatives or any modifications shall render the Tender invalid.

SUBMISSION OF TENDER

11.1 **TECHNICAL BID: All requisite documents shall be uploaded at** www.eprocure.gov.in However following documents to be submitted physically also.

(i) Earnest Money

(ii) Cost of Tender document (in case of Tender Document downloaded from the website by the tenderer)

(iii) 'Integrity Pact'

(iv) Power of Attorney: Authority to sign the bid document to be submitted

Authority to Sign

(a) If the applicant is an individual, he should sign above his full type written name and current address.

(b) If the applicant is a proprietary firm, the Proprietor should sign above his full type written name and the full name of his firm with its current address.

(c) If the applicant is a firm in partnership, the Documents should be signed by all the partners of the firm above their full type written names and current addresses. Alternatively, the Documents should be signed by a partner holding Power of Attorney for the firm in the Format at **Annexure IV.**

(d) If the applicant is a limited Company, or a Corporation, the Documents shall be signed by a duly authorized person holding Power of Attorney for signing the Documents in the Format at **Annexure IV.**

(e) If the applicant is a Joint Venture, the Documents shall be signed by the Lead Member holding Power of Attorney for signing the Document in the Format at **Annexure V.**

1.2 **FINANCIAL BID: The bidder shall quote all rates for each item including all taxes including GST on the items. The GST on each item shall be the GST on input and shall not be reimbursable. Bidder while submitting/filing GST on the output i.e. work done should claim credit of input GST. The net output GST i.e. after taking credit of input GST shall be paid to the Govt as per procedure in vogue. NHIDCL shall reimburse the net output GST paid to the Govt on submission of proof of GST paid. To be submitted online only at** www.eprocure.gov.in

11.3 All documents mentioned in Para 11.1 must be received by the Employer at the

following address not later than **11.00** Hrs. On 16.04.2020**.** In the event of the specified date for the submission of the Tender being declared a **holiday by the Employer/Strike/Bandh or on any account the office being closed,** the documents will be received up to the appointed time on the next working day.

Address for submission of documents

General Manager (Project), NHIDCL, National Highways & Infrastructure Development Corporation Limited, (A Govt. of India Undertaking), 3rd Floor, PTI Building, 4 Parliament Street, New Delhi – 110001.

11.4 The Employer may extend the deadline for submission of Tenders by issuing an amendment in writing in accordance with Para 7.3 in which case all rights and obligations of the Employer and the tenderer previously subject to the original deadline will be subject to new deadline. The on line Bidding doesn't permit submission of offer after stipulated date & time of the E Tender, hence there is no scope for late / delayed tender.

11.5 Integrity Pact

(i) The bidder/contractor is required to enter into an Integrity Pact with the Employer, in the Format at Annexure VIII. The Integrity Pact has already been signed by NHIDCL for and on behalf of Employer as its Agent/Power of Attorney Holder. While submitting the bid, the Integrity Pact shall also be signed by the duly authorized signatory of the Bidder/Lead Member of JV. In case of failure to submit the Integrity Pact duly singed and witnessed, along with the bid, the bid is likely to be rejected.

(ii) In case of any contradiction between the Terms and Conditions of the Bid Document and the Integrity Pact, the former will prevail.

(iii) The name and address of the Independent External Monitors as well as the Name, designation and address of the official nominated by the Employer to act as the Liaison Officer between the Independent External Monitor and the Engineer-in-Charge as well as the Contractor - Shri S N Dash, IAS (Retd.).

TENDER OPENING, EVALUATION AND CLARIFICATIONS OF APPLICATIONS

12.1 The PACKET containing tender fee and Earnest Money of all the tenderers will be opened first and checked. If the tender fee and Earnest Money furnished is not for the

stipulated amount or is not in an acceptable form, the bidder shall be declared non-eligible for technical evaluation and online technical bid shall not be opened.

12.2 TECHNICAL BID of other tenderers who have furnished Earnest Money and tender fee of correct amount in acceptable form will then be opened.

1.3 The Employer will scrutinize the Technical Bids accepted for evaluation to determine whether each tenderer

(i) has submitted 'Authority to sign' as per Para 11.2 above and Integrity Pact duly signed and witnessed as per Para 11.7 above;

(ii) meets the Qualification Criteria stipulated in Para 2.0; and

(iii) conforms to all terms, conditions and specifications of the Tender Document without any modifications or conditions.

1.4 If required, the Employer may ask any such tenderer for clarifications on his Technical Bid. The request for clarification and the response from the tenderer will be in writing. If a tenderer does not submit the clarification/document requested, by the date and time set in the Employer's request for clarification, the bid of such tenderer is likely to be rejected.

1.5 Tenderers whose Technical Bids are found acceptable will be intimated through www.eprocure.gov.in accordingly of the time and date and place where and when the Financial Bid will be opened.

At the appointed place, time and date, in the presence of the tenderers or their representatives who choose to be present, the Employer will open the FINANCIAL BID on www.eprocure.gov.in

INSPECTION OF SITE BY THE TENDERERS

Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders, as to the nature of the ground and sub-soil (as far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity, access,

facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant etc. will be issued to him by the Employer and local conditions and other factors having a bearing on the execution of the work.

EMPLOYER'S RIGHT ON ACCEPTANCE OF ANY TENDER

(i) If required, the Employer may ask any tenderer the breakdown of unit rates. If the tenderer does not submit the clarification by the date and time set in the Employers request for clarification, such tender is likely to be rejected.

(ii) The competent authority on behalf of the Employer does not bind himself to accept the lowest or any other tender and reserves to himself the authority to reject any or all the tenders received without the assignment of any reason. All tenders in which any of the prescribed conditions is not fulfilled or any condition is put forth by the tenderer shall be summarily rejected.

CANVASSING PROHIBITED

Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the Contractors who resort to canvassing will be liable to rejection.

EMPLOYER'S RIGHT TO ACCEPT WHOLE OR PART OF THE TENDER

The competent authority on behalf of the Employer reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.

MISCELLANEOUS RULES AND DIRECTIONS

The tenderer shall not be permitted to tender for works if his near relative is posted as an officer in any capacity of the Employer.

He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted officer in

the organization of the Employer. Any breach of this condition by the tenderer would render his Tender to be rejected.

No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Organisation of the Employer is allowed to work as a contractor for a period of one year after his retirement from the Employer's service without the previous permission of the Employer in writing. The contract is liable to be cancelled if either the Contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Employer as aforesaid before submission of the tender or engagement in the Contractor's service.

If required by the Employer, the tenderers shall sign a declaration under the officials Secret Act 1923, for maintaining secrecy of the tender documents drawings or other records connected with the work given to them. The unsuccessful tenderers shall return all the drawings given to them.

Use of correcting fluid anywhere in tender document is not permitted. Such tender is liable for rejection.

In the case of Item Rate Tenders, only rates quoted shall be considered. Any tender containing percentage below/above the rates quoted is liable to be rejected. Rates quoted by the contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, if a discrepancy is found, the rates which correspond with the amount worked out by the contractor shall unless otherwise proved be taken as correct. If the amount of an item is not worked out by the contractor or it does not correspond with the rates written either in figures or in words then the rates quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally but the amount is not worked out correctly, the rates quoted by the contractor will, unless otherwise provided, be taken as correct and not the amount.

In the case of any tender where unit rate of any item/items appear unrealistic, such tender will be considered as unbalanced and in case the tenderer is unable to provide satisfactory explanation, such a tender is liable to be disqualified and rejected.

All rates shall be quoted on the tender form. The amount for each item should be worked out and requisite totals given. Special care should be taken to write the rates in figures as well as in words and the amount in figures only, in such a way that interpolation is not possible. The total amount should be written both in figures and in words. In case of figures, the word 'Rs.' should be written before the figure of rupees and word 'P' after the decimal figures, e.g. Rs.2.15 P and in case of words, the word, 'Rupees' should precede and the word 'Paise' should be written at the end. Unless the rate is in whole rupees and followed by the word 'only' it should invariably be up to two decimal places.

While quoting the rate in schedule of quantities, the word 'only' should be written closely following the amount and it should not be written in the next line.

GST, Purchase Tax, Turnover Tax or any other Tax/ Cess on material, labour and Works in respect of this Contract shall be payable by the Contractor and the Employer will not entertain any claim whatsoever in respect of the same.

The tender for the work shall not be witnessed by a Contractor or Contractors who himself/themselves has/ have tendered for the same work. Failure to observe this condition would render tenders of the Contractors tendering, as well as witnessing the tender, liable to summary rejection.

SIGNING OF CONTRACT AGREEMENT

The tenderer whose tender has been accepted will be notified of the award by the employer by issue of a 'Letter of Acceptance' 'prior to expiration of the Bid Validity period, in the form at **Annexure VI.** Within the period specified in Clause 1 of 'Clause of Contract', of the date of issue of Letter of Acceptance, the successful tenderer shall deliver to the Employer, Performance Guarantee.

The Letter of Acceptance will be sent to the Contractor in two copies one of which he should return promptly, duly signed and stamped. The Letter of Acceptance will be a binding Contract between the Employer and the Contractor till the formal Contract Agreement is executed.

The tenderer whose Tender is accepted shall be required to submit stamp papers of appropriate value as per the provisions of Indian Stamp Act within 15 days of the date of issue of Letter of Acceptance. The cost of the stamp papers shall be borne by the tenderer.

At the same time the Employer notifies the successful tenderer that his tender has been accepted, the Employer will direct him to attend the Employer's office within 28 days of issue of Letter of Acceptance for signing the Agreement in the Proforma at **Annexure VII**.

Enclosure-I

Jogighopa MMLP

Objective:

Following the Logistics Efficiency Enhancement Policy (LEEP), enhancing the logistics efficiency and reducing the demand and supply related constraints as well as the logistics cost for movement of cargo in the North East region. The facility is also expected to aide in Export Import (EXIM) trade facilitation.

Background:

1. SOP for implementation of Bharatmala Pariyojana envisages development of 35 nos. Multimodal Logistic Park has been proposed with the objective to improve the efficiency of the existing corridors (GQ and NS-EW).

2. Guwahati was one among the 35 proposed locations for developing an MMLP which was subsequently shifted to Jogighopa.

3. Proposed Inland Waterway Terminal is approximately 6kms from the proposed site providing it with potential of multimodal integration.

4. **MMLP at Jogighopa shall be first MMLP of India. This will integrate the road, rail and water transportation.** Govt. of Assam has allocated 200 acres of land belonging to Ashok Paper Mill (APM) and Inland Waterways Authority of India (IWAI) also agreed to allocate 40 acres for land for development of IWT. **The project is planned for operation in the year 2022.**

Characteristics of MMLP:

1. The MMLP is envisaged to act as world-class logistic aggregation/ disaggregation point for various forms of cargo across all modes, within a single facility.

2. MMLPs will be a freight-handling facility with access to multimodal transport, comprising of multimodal container terminals, cargo terminals (bulk, break bulk), warehouses, cold storage, facilities for mechanized material handling, value-added services such as customs clearance with bonded storage yards, quarantine zones, testing facilities, and warehousing management services etc. Accordingly, development of road connectivity, Railway connectivity and waterways connectivity are part of MMLP.

3. The prime objectives associated with the proposed project are:

   i. To provide a state-of-the-art large-scale warehousing facility for bulk, break bulk as well as container cargo.

   ii. To be a one stop solution for all services related to cargo movement – warehousing, custom clearance, parking, maintenance of trucks etc.

   iii. Technology driven implementation of a state of the art freight management system.

   iv. Provision for value added services such as packaging, re-packaging, labeling etc.

Jogighopa MMLP project characteristics:

1. The demand potential of cargo in the region has been envisaged to be around 13.32 MMTPA. The trend in cargo is expected to be:

   i. 18% share of containerised cargo in Year 2052 from sub 1% share currently.

   ii. Modal mix of 55% by road, 36% by rail and 9% by IWT in the Year 2052 from approximately 70:30 (road: rail) split currently.

2. The master plan envisages the following areas for respective services:

ACTIVITIES	AREA (ACRES)	PERCENTAGE
Core Logistics Area	**118.84**	**62.55%**
Warehousing	*81.41*	
Cold Storage	*5.17*	
Value added services	*3.27*	
Rail siding	*14.14*	
Container Yard	*9.89*	
EXIM /Bonded/ Quarantine/testing facility	*4.96*	
Ancillary Logistic	**4.79**	**2.52%**
Admin	*1.4*	
Lodging/ Boarding/ Vehicle maintenance/ Dhabas	*1.2*	
Office for transporters / vehicle sales	*1.52*	
Petrol Pump	*0.67*	
Commercial / Service apartments	**6.08**	**3.20%**
MMLP Internal Roads	**23.38**	**12.31%**
Truck Parking	**10.99**	**5.78%**
Utilities	**6.08**	**3.20%**
Green and Landscaped areas	**19.84**	**10.44%**
TOTAL	**190**	

3. According to the master plan, the facility is expected to have a throughput capacity of 11.45 Million Metric Tonne Per Annum (MMTPA).

Implementation modality:

1. The land measuring approximately 200 acres (the "Project Area"), owned by Ashok Paper Mill, a State Government company (the "Government Land") shall be provided by the State Govt of Assam (SGoA). Accordingly, a MoU has also been signed between NHIDCL and SGoA. Out of 200 acres, approx. 190 acres will be used for the core logistics park activity while 10 acres will be used for providing the connectivity road.

2. The facility is planned for developed in 2 phases:

   - **Phase I**: 102 acres of Logistics park along with the external road and rail connectivity between Logistic park and IWT
   - **Phase II**: Remaining 88 acres of logistic park and 40 acres of IWT

3. Roads, railways, other infrastructures shall be developed by NHIDCL under the aegis of Ministry of Road Transport and Highways (MoRT&H) which has committed for expenditure through Administrative Approval and Financial Sanction (AA&FS) of Rs 693.97 Cr issued vide Letter No. H-39011/10/2017-P&P(Pt-VI) dated 3rd Feb 2020.

4. Further, the capital expenditure for phase 1 development of the MMLP is divided into two stages.

   - Stage I - encompasses land development and development of external road and rail connectivity infrastructure with investment amounting to Rs 503.3 Cr.
   - Stage II - Balance investment of INR 190.67 Cr would be taken up as required at O&M stage depending on the bid response.

5. The civil works of the project is likely to take off in Sep 2020 depending upon the Environment clearances which has already initiated and acquisition of land to provide connectivity with NH for which 3(A) has also been published.

6. Three Bids for civil work under stage-I have been invited by the NHIDCL in Mar 2020 with aim to award the work in Apr 2020 and start the work in Sep 2020 i.e. start of working season.

   - Package-I : All internal roads and road connectivity between NH and IWT and MMLP and IWT at the cost of Rs 170 Cr.

- Package-II : Administrative building, custom building, utility, sewage treatment plant and water plant at the cost of Rs 70 Cr
- Package-III : Rail connectivity and sidings at the cost of Rs 23 Cr.

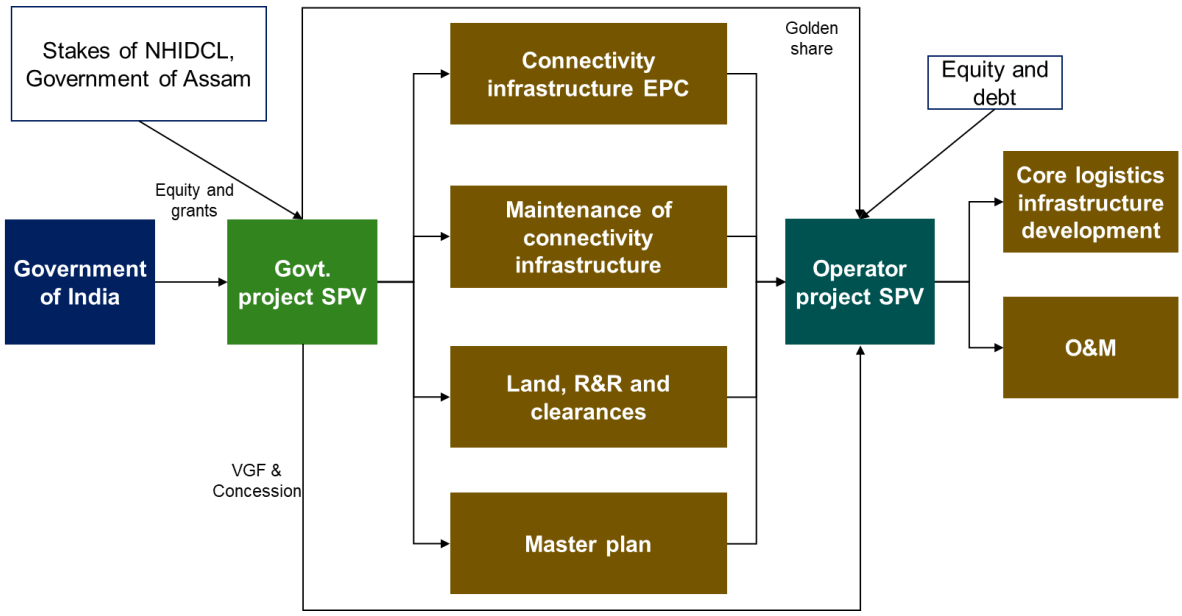
NHIDCL has decided to utilise the monsoon period upto Sep 2020 i.e. non-working window for design approvals, LA and EC approvals. Construction period is being considered as 18 months to complete the project by Mar 2022.

Operational Modality:

1. Since the entire project developed with cooperation of the SGoA, a SPV structure is envisaged for MMLP Jogighopa with shareholdersas MoRTH (through NHIDCL) and Government of Assam (through APM). Draft SPV has been prepared and under discussion/finalisation.

2. The main role of SPV shall be to ensure safe, efficient and profitable operations of the facility and conforming to corporate governance standards. This shall be accomplished by the SPV directly or through intermediaries. The roping of IWAI shall also be decided by SPV inter-alia other scope including expansion of second phase in balance land.

3. The operating model envisaged for the project has been provided in the subsequent diagram:



7. Brief work split between the private entity and government entity has been provided below:

Scope	Private SPV	Government SPV
Land acquisition		✓
R&R		✓
Trunk Connectivity		✓
Master plan		✓
Utility infrastructure		✓
Warehouse	✓	
Terminal		✓
Equipment	✓	
O&M	✓	

Expected impact of Jogighopa MMLP facility:

1. 9.98% logistics cost reduction

2. 9.27% increase in overall consumption

3. >10,000 MT CO2e saving in GHG emissions

4. >2 million direct, indirect and induced job creation

ANNEXURE – I

QUALIFYING CRITERIA FOR WORKS CONTRACTS

1. ANNUAL FINANCIAL TURNOVER

The tenderer must have received contractual payments in the previous three financial years and the current financial year up to the date of opening of tender, at least 150% of the advertised value of the tender (Rs. 33.67 Crore). The tenderers shall submit Certificates to this effect which may be an attested Certificate from the concerned department / client and/or Audited Balance Sheet duly certified by the Chartered Accountant etc.

Notes:

(i) The financial turnover will be taken as given under the head "Income" in audited Profit and Loss Account and excluding non-recurring income, income from other sources and stock. It is clarified that the Financial Turnover means relevant revenue as recorded in the Income side of Profit and Loss Account. It does not mean Profit.

(ii) Closing stocks in whatsoever manner should not form part of turnover.

(iii) Weightage of 5% (compounded annually) shall be given for equating the financial turnover of the previous years to the current year.

(iv) For considering the financial years, for example for a work for which the tender is being opened in financial year 2019-20, the last three financial years shall be 20118-19, 2017-18 & 2016-17. For a tender opened on (say) 06.10.19 (F.Y. 2019-20), with weightage of 5% compounded annually, the weightages to be applied on the Turnover of the previous three Financial Years will be: F.Y. 2018-19 = 1.050; F.Y. 2017-18 = 1.103; F.Y. 2016-17 = 1.158;

(v) The bidder should furnish Annual Financial Turnover for each of the last 3 financial years in tabular form and give reference of the document (with page no.) relied upon in support of meeting the Qualification Criteria.

(vi) The tenderer should submit self-attested copy of Auditor's Report along with Balance Sheet and Profit and Loss Statement along with Schedules for the relevant financial year in which the minimum criterion is met. **Provisional audit reports or certified statements may not be accepted.**

(vii) If the Audited Balance Sheet for the immediately preceding year is not available in case of tender opened before 30th Sept., audited Balance Sheets, Profit and Loss Statements and other financial statements of the five financial years immediately preceding the previous year may be adopted for evaluating the credentials of the bidder.

2. WORK EXPERIENCE

(a) **Similar Works Experience**

The bidder should have satisfactorily completed in his own name or proportionate share as member of a Joint Venture, at least one similar work costing not less than the amount equal to 60% of advertised value of the tender (**Rs.13.47 Crore)** OR at least two similar works costing not less than the amount equal to 40% of advertised value of the tender (**Rs.8.98 Crore)** OR at least three similar works costing not less than the amount equal to 30% of advertised value of the tender (**Rs.6.73 Crore)** during the last 7 (Seven) years prior to the date of submission of the bid. Works completed prior to the cut-off date shall not be considered.

Similar Works

Similar Works shall mean the work of
(a) Earth work in formation
(b) P. Way Linking work
(c) RCC work

Notes:

(i) A weightage of 5% (compounded annually from the date of completion of the work to the submission of the bid) shall be given for equating the value of works of the previous years to the current year.

(ii) Only such works shall be considered where physical completion of entire work is over or commissioning of work has been done, whichever is earlier.

(iii) The bidder should submit the details of such similar completed works as per the format at Proforma-1 enclosed. The value of work executed should be inclusive of the value of free supply items and escalation amount, if any.

(iv) The cost of rails will be considered for the value of work executed.

(v) The bidder should include details of only such works in Proforma 1 which satisfy the Qualification Criteria and submit supporting details/ credentials of only such works.

(vi) Credential certificates issued by Govt. Organizations/ Semi Govt. Organizations/ Public Sector Undertakings/ Autonomous bodies / Municipal bodies/ Public Ltd. Cos. listed on BSE/NSE shall only be accepted for assessing the eligibility of a tenderer. Certificates issued by such Public Ltd. Co. must be supported by TDS Certificates evidencing the value of work.

In case of certificate from a Public Limited Co., the bidder should also submit documentary proof that the Public Limited Co. was listed on BSE/NSE when the work was executed for it.

(vii) The cut-off date shall be calculated backwards from the date of submission/opening of tender i.e. for a tender which is being opened on 6.10.19, the cut-off date shall be 07.10.16.

(b) Construction Experience in key activities/specified components

To qualify for award of the contract, each bidder in its name should have in the last 3(Three) years prior to the date of submission of the bid executed the following key activities.

1.	Earthwork in cutting/filling:	50,000 Cum.
2.	RCC work:	4000 Cum.
3.	P. Way Linking work:	3.00 Kms.

- The work satisfying the criteria for a particular key activity may be different from a work satisfying the criteria for another key activity.
- The bidder should furnish with his bid a tabular statement giving contract-wise quantities of key activities / specialised components executed in the last 5 years which meet Qualification Criteria along with documentary proof in support thereof (indicating page nos.).
- Even if a work has not been completed but if the specified quantity of the key activity has been completed, the same shall be taken into consideration for the purpose of this criteria.

3. SOLVENCY CERTIFICATE (APPLICABLE)

A Solvency Certificate of minimum solvency of **Rs.11.39 Crore** (suggested format at Proforma 2) from a Nationalized or a Scheduled Bank issued not earlier then 6 months from the last date of submission of tender is required to be submitted by the bidder.
The Certificate so produced by the Bidder may be got verified from the issuing Bank.

4. PROFITABILITY

The applicant firm shall be a profit (net) making firm and shall have made profit in each of the two immediately preceding Financial years and at least one out of the three earlier Financial years.

The bidder should furnish net profit of last 3 years in tabular form and submit attested copies of Auditor's Reports along with audited Balance Sheets and Profit and Loss Statements for the last five financial years. In case the firm is profit making for the last three financial years continuously, the bidder may submit the above documents for last three financial years only. Specific reference with page no. of document which satisfies the Qualifying Criteria shall be indicated in the tabular statement.

5. JOINT VENTURES

Whether Joint Venture allowed: **No.**

6. DECLARATION OF THE BIDDER

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

(a) Made misleading or false representation in the forms, statements and attachments in proof of the qualification requirements. In such a case, besides tenderer's liability to action under Para 9.4 of Instructions to Tenderers, the tenderer is liable to face the penalty of banning of business dealing with him by NHIDCL.

(b) Records of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history or financial failures etc.

(c) Their business banned by any Central/State Government Department/ Public Undertaking or Enterprise of Central/State Government.

(d) Not submitted all the supporting documents or not furnished the relevant details as per the prescribed format.

A declaration to the above effect in the form of affidavit on stamp paper of Rs.10/- duly attested by Notary/Magistrate should be submitted as per format given in Proforma 3 enclosed.

7. CHECK LIST OF DOCUMENTS TO BE SUBMITTED

(a) **By Bidders other than Joint Ventures**

(i) Annual Turnover

- Annual financial turnover for each of the last 3 years in tabular form.

- Self-attested copies of Auditor's Report along with the Balance Sheet and Profit and Loss Statement for the relevant financial year in which the minimum criterion is met (Refer Notes under Para 1)

(ii) Work Experience

- Similar Work Experience: Proforma 1 with details of 1, 2 or 3 works as the case may be, which satisfy requisite qualification criterion (Refer Para 2a).

- Construction Experience in Key Activities/Specialised Components: Tabular Statement giving contract-wise quantities executed in last 3 years along with documentary proof in support of having met the criterion (Refer Para 2b).

(iii) Solvency Certificate

Suggested format at Proforma 2 (Refer Para 3)

(iv) Profitability

- Net profit of last 3 years in tabular form.
- Self-attested copies of Auditor's Report along with the Balance Sheets and Profit and Loss Statements for last 5 or 3 financial years, as the case may be (Refer Para 4).

(v) Declaration by Bidder Proforma 3 (Refer Para 6)

(vi) Integrity Pact (where applicable): duly signed and witnessed in the format at Annexure VIII (Refer Para 11.7)

Proforma-1

LIST OF SIMILAR WORKS SATISFYING QUALIFICATION CRITERIA COMPLETED DURING THE LAST 3 YEARS

S. No	Client's Name and Address	Name of the Work & Location	Scope of work carried out by the Bidder	Agreement / Letter of Award No. and date	Contract Value (Rs. in Lakhs)		Value of Materials Supplied free by the client	Date of Start	Date of Completion		Reasons for delay in completion if any	Ref. of document (with page no.) in support of meeting qualification criteria
					Awarded	Actual on completion			As per LOA/ Agreement	Actual		

SEAL AND SIGNATURE OF THE BIDDER

Note:

1. In support of having completed above works attach self-attested copies of the completion certificate from the owner/client or Executing Agency/Consultant appointed by owner/client, 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.
2. Such Credential certificates issued by Govt. Organizations/ Semi Govt. Organizations / Public Sector Undertakings / Autonomous bodies / Municipal Bodies / Public Ltd. Co. listed on BSE/NSE shall only be accepted for assessing the eligibility of a tenderer. Certificates issued by such Public Ltd. Co. must be supported by TDS Certificates evidencing the value of work.
   In case of certificate from a Public Limited Co., the bidder should also submit documentary proof that the Public Limited Co. was listed on BSE/NSE when the work was executed for it.
3. Information must be furnished for works carried out by the Bidder in his own name or proportionate share as member of a Joint Venture. In the latter case details of contract value including extent of financial participation by partners in that work should be furnished.
4. Use a separate sheet for each partner in case of a Joint Venture.
5. Only similar works completed during the last 3 years which meet the Qualification Criteria need be included in this list.

Proforma 2

SOLVENCY CERTIFICATE FROM A NATIONALISED OR A SCHEDULED BANK

This is to certify that to the best of our knowledge and information, M/s_____, having their registered office at _____, a customer of our bank is a reputed company with a good financial standing and can be treated as solvent to the extent of Rs. _____. This certificate is issued without any guarantee or risk and responsibility on the Bank or any of its officers.

Signature with date

Senior Bank Manager (Name of Officer issuing the Certificate)

Name, address & Seal of the Bank/ Branch

Note:

Banker's Certificate should be on letter head of the Bank.

Proforma 3

DECLARATION BY THE BIDDER

(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 delays in completion, litigation history or financial failures etc.

iii) Business has not been banned with us by any Central/State Government Department / Public Sector Undertaking or Enterprise of Central / State Government.

iv) We have submitted all the supporting documents and furnished 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.

vi) We understand that in case any statement/information/document furnished by us or to be furnished by us in connection with this offer, is found to be incorrect or false, our EMD in full will be forfeited and Business dealing will be banned.

SEAL, SIGNATURE & NAME OF THE BIDDER

Signing this document

ANNEXURE II A

QUALIFICATION INFORMATION / CHECKLIST OF DOCUMENTS LETTER OF TRANSMITTAL BY OTHER THAN JOINT VENTURES

(On letter head of the Applicant)

From,
_____

To,
NHIDCL

Sir,

Sub: Submission of Qualification information /documents as per Checklist.

1. I/We hereby submit the following documents in support of my/our satisfying the Qualification Criteria laid down for the work: -

   a) Self-attested copy of Partnership Deed/ Memorandum and Articles of Association of the firm.
   b) Self-attested copy of PAN/TAN issued by Income Tax Department.
   c) Self-attested copy of a certificate, confirming that the applicant is a working contractor or have executed any work within the last five years reckoned from the date of opening of Tender, issued by Railways, CPWD, MES, DOT, NHIDCL, State PWD or any other Central/State Government Undertaking, Municipal Body, Autonomous Body or Public Limited Company listed on NSE/BSE.
   d) Annual Turnover
      (i) Annual financial turnover for each of the last 3 years in tabular form.
      (ii) Self-attested copy of Auditor's Report along with the Balance Sheet and Profit and Loss Statement and Schedules for the relevant financial year in which the minimum criterion is met, with calculations in support of the same.
   e) Work Experience
      (i) Similar Works Experience: - In Proforma 1 with details of 1 / 2 / 3 works as applicable and self-attested copies of supporting documents as mentioned therein.
      (ii) Construction experience in key activities / specialised components: Tabular Statement giving contract wise quantities executed in last 5 years with documentary proof.
   f) Solvency Certificate - Proforma 2.
   g) Profitability - Net profit of last 3 years in tabular form with self-attested copies of Profit and Loss Statements for the last 3 Financial Years as applicable.

h) Declaration– Proforma 3

i) Self-attested copy of Sales Tax, Works Contract Tax, Service Tax, and Registration Certificate (as applicable).

j) Self-attested copy of Registration under Labour Laws, like PF, ESI etc.

k) Self-attested copy of ISO 9000 Certificate (if any)

l) Integrity Pact (where applicable): duly signed and witnessed.

2. I have furnished all the information and details necessary to prove that I satisfy all the Qualification Criteria laid down.

3. I authorize you to approach any Bank, Individual, Employer, Firm or Corporation, whether mentioned in the enclosed documents or not, to verify our competence and general reputation.

4. I have also enclosed written Power of Attorney of the signatory of the tender on behalf of the tenderer.

Yours faithfully,

Encl.: as In Para 1

Signature of Applicant

with Name _____

Date with seal

ANNEXURE II B (L)

QUALIFICATION INFORMATION / CHECKLIST OF DOCUMENTS LETTER OF TRANSMITTAL BY JOINT VENTURE

(To be signed by the Lead Member for Large Works Costing over Rs.30 crores on letter head of the Partner-in-charge/Lead member)

- NOT APPLICABLE -

ANNEXURE II B (N)

QUALIFICATION INFORMATION / CHECKLIST OF DOCUMENTS LETTER OF TRANSMITTAL BY JOINT VENTURE

- NOT APPLICABLE -

QUALIFICATION INFORMATION / CHECKLIST OF DOCUMENTS LETTER OF TRANSMITTAL BY JOINT VENTURE

(To be signed by the Lead Member)

(FOR NORMAL WORKS COSTING BETWEEN Rs.1 CRORE and Rs.30 CRORES)

- NOT APPLICABLE -

ANNEXURE III

DRAFT MEMORANDUM OF UNDERSTANDING EXECUTED BY MEMBERS OF THE CONSORTIUM / JOINT VENTURE

(On each firm's letter Head)

- NOT APPLICABLE -

ANNEXURE IV

FORMAT FOR POWER OF ATTORNEY TO AUTHORISED SIGNATORY POWER OF ATTORNEY

(To be executed on non-judicial stamp paper of the appropriate value in accordance with relevant Stamp Act. The stamp paper to be in the name of the firm/ company who is issuing the Power of Attorney).

We, M/s._____ (name of the firm/company with address of the registered office) hereby constitute, appoint and authorise Mr./Ms._____ (Name and residential address) who Is presently employed with us and holding the position of _____, as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to our bid for the work _____ (name of work), including signing and submission of application proposal, participating in the meetings, responding to queries, submission of information / documents and generally to represent us in all the dealings with NHIDCL or any other Government Agency or any person, in connection with the works until culmination of the process of bidding till the Contract Agreement is entered into with NHIDCL and thereafter till the expiry of the Contract Agreement.

We hereby agree to ratify all acts, deeds and things lawfully done by our said Attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid Attorney shall and shall always be deemed to have been done by us.

(Add in the case of a Consortium/Joint Venture)

Our firm is a Member/Lead Member of the Consortium of _____, _____ and_____. Dated this the _____ day of _____ 20

_____

(Signature and name of authorized signatory)

_____

(Signature and name in block letters of all the remaining partners of the firm, Signatory for the Company)

Seal of firm/ Company

Witness 1:	Witness 2:
Name:	Name:
Address:	Address:
Occupation:	Occupation:

Notes:

- To be executed by all the members individually. In case of a Consortium/JV, the authorized signatory has to be the one employed by the Lead Member.

- The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

ANNEXURE V

FORMAT FOR POWER OF ATTORNEY TO LEAD MEMBER OF CONSORTIUM / JOINT VENTURE

- NOT APPLICABLE -

ANNEXURE VI

(FORM OF LETTER OF ACCEPTANCE)
(By REGD POST / ACK.DUE)

(On the letter head of NHIDCL)

No.:_____ Dated:

To,

_____
(Name & Address of the Contractor)

Dear Sirs,

Sub.: TENDER No.: FOR THE WORK OF

Ref.: Your tender dated _____ and letter dated

This is to notify you that your Tender for the work under reference has been accepted by the Competent Authority of NHIDCL for a total Contract Price of Rs. _____ (Rupees _____only) in its capacity as an Agent /Power of Attorney Holder acting for and on behalf of _____ (the Employer).

Pursuant to Clause 1 of the Contract, you are required to furnish irrevocable Performance Guarantee for an amount equivalent to 5% (Five percent) of the Contract Price. The Guarantee of amount of Rs. _____ is required to be submitted within ___ days of issue of this Letter of Acceptance.

The time of _____months allowed for execution of the work will be reckoned from 15 days after the date of issue of this Letter of Acceptance or from the first day of the handing over of the site, whichever is later, in accordance with phasing, if any, indicated in tender document.

You are requested to contact _____ (complete designation and address of the project-in-charge) for carrying out the contract.

You are also requested to attend this office within Twenty-Eight days from the date of issue of this letter for execution of the formal agreement. In terms of Para 18.1.1 of Section-1 of the Tender documents, you are requested to submit Stamp paper of Rs.100/- each in duplicate within 15(fifteen) days of issue of this Letter of acceptance to this effect. It may be noted that no payment shall be made for any work carried out by you till the Agreement is executed and till such time the Performance Guarantee has been submitted by you.

This Letter of Acceptance is being sent to you in duplicate and you are requested to return without delay one copy of the letter duly signed and stamped, as a token of your acknowledgement.

Kindly note that this Letter of Acceptance shall constitute a binding Contract between us pending execution of formal Agreement.

Your letter referred to above shall form part of the Contract.

Yours faithfully,

NHIDCL

For and on behalf of_____ (The Employer)

Copy to:

1._____ (The Employer) for information.

(To be included on the Original sent to the Contractor)

2. Project-in-charge (Complete designation and address)

3. Associated Finance (Not in original)

ANNEXURE VII

FORM OF AGREEMENT
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

Agreement No. _____ dated _____

THIS AGREEMENT is made on _____ day of _____ Two thousand _____between NHIDCL, a Government of India Enterprise and a Company registered under Companies Act, 1956 having its registered office at 3rd Floor, PTI Building, 4 Parliament Street, New Delhi – 110001 acting for and on behalf of and as an Agent /Power of Attorney Holder of _____ hereinafter called the Employer (which expression shall, wherever the context so demands or requires, include their successors in office and assigns) on one part and M/s._____ hereinafter called the Contractor (which expression shall wherever the context so demands or requires, include his/ their successors and assigns) of the other part.

WHEREAS the Employer is desirous that certain works should be executed viz._____ (brief description of the work) and has by Letter of Acceptance dated_____ accepted a tender submitted by the Contractor for the execution, completion, remedying of any defects therein and maintenance of such works at a total Contract Price of Rs. _____ (Rupees _____ only)

NOW THIS AGREEMENT WITNESSETH as follows: -

1. In this agreement words and expressions shall have the same meaning as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents in conjunction with addenda/ corrigenda to Tender Documents shall be deemed to form and be read and construed as part of this agreement viz.

   (a) The Letter of Acceptance dated_____.
   (b) Schedule (Bill) of Quantities
   (c) Notice Inviting Tender and Instructions to Tenderers
   (d) NHIDCL Tender and Contract Form
   (e) Special Conditions / Specifications
   (f) Schedules A to F
   (g) General Specifications
   (h) Drawings
   (i) Amendments to Tender Documents
   (j) General Conditions of Contract **(read with up to date Correction Slip)** comprising of

(i) Conditions of Contract
(ii) Clauses of Contract
(iii) NHIDCL Safety Code
(iv) NHIDCL- Model Rules for the protection of Health and Sanitary arrangements for Workers
(v) NHIDCL– Contractor's Labour Regulations.

3. In consideration of the payment to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute, complete, remedy defects therein and maintain the works in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay to the Contractor in consideration of the execution, completion, remedying of any defects therein and maintenance of the works, the contract price or such other sum as may become payable under the provisions of the contract at the time and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused their respective common seals to be here into affixed (or have herewith set their respective hands and seals) the day and year first above written.

SIGNED, SEALED AND DELIVERED BY

_____	_____
In the capacity of _____	representing NHIDCL In the capacity of Agent / Power of of Attorney Holder
On behalf of M/s. _____	For and on behalf of _____
(The Contractor)	(The Employer)
In the presence of	In the presence of
Witnesses (Signature, Name & Designation)	Witnesses (Signature, Name & Designation)
1.	1.
2.	2.

ANNEXURE VIII

INTEGRITY PACT

Between

NHIDCL acting for and on behalf of and as an Agent / Power of Attorney Holder of National Highways & Infrastructure Development Corporation Limited, (A Govt. of India Undertaking) hereinafter called the "Employer" AND_____ hereinafter referred to as "The Bidder/Contractor"

Preamble

The Employer intends to award, under laid down organizational procedures, contract/s for_____. The Employer values full compliance with all relevant laws and regulations, and economic use of resources, and of fairness and transparency in his relations with the Bidder/s and/or contractor/s.

In order to achieve these goals, the Employer will appoint an Independent External Monitor (IEM) who will monitor the Tender process and execution of the contract for compliance with the principles mentioned above.

Section–1: Commitments of the Employer

(1) The Employer commits himself to take all measures necessary to prevent corruption and to observe the following principles: -

(i) No employee of the Employer, personally or through family members, will in connection with the tender or for the execution of the contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(ii) The Employer will, during the tender process, treat all Bidders with equity and reason. The Employer will in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential/additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.

(iii) The Employer will exclude from the process all known prejudiced persons.

(2) If the Employer obtains information on the conduct of any of his employees which is a criminal offence under the IPC (Indian Penal Code) /PC (Prevention of Corruption) Act, or if there be a substantive suspicion in this regard, the Employer will inform its Chief Vigilance Officer and in addition can initiate disciplinary action.

Section– 2: Commitments of the Bidder/Contractor

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

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

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

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

(iv) The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

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

Section- 3: Disqualification from tender process and exclusion from future contracts

If the Bidder/Contractor, before award or during execution has committed a transgression through a violation of Section 2 above, or in any other form such as to put his reliability or credibility in question, the Employer is entitled to disqualify the Bidder/Contractor from the tender process or take action as per the procedure mentioned in the "Guideline on banning of business dealing" annexed and marked as **Annexure "IX**".

Section- 4: Compensation for Damages

(1) If the Employer has disqualified in terms of the provisions in Section 3, the Bidder/Contractor from the tender process prior to the award of contract, the Employer is

entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

(2) If the Employer has terminated the contract during execution in terms of the provisions under Section 3, the Employer shall be entitled to demand and recover from the Contractor the damages equivalent to Earnest Money Deposit, Security Deposits already recovered and Performance Guarantee, which shall be absolutely at the disposal of the Employer.

Section -5: Previous transgression

(1) The Bidder/ Contractor declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the Anti-Corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

(2) If the Bidder/Contractor makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as per the procedure mentioned in "Guideline on banning of business dealing".

Section -6: Equal treatment of all Bidders/Contractors/Sub-Contractors

(1) The Bidder/Contractor undertakes to demand from all partners/sub-contractors (if permitted under the conditions/ clauses of the contract) a commitment to act in conformity with this Integrity Pact and to submit it to the Employer before signing the contract.

(2) The Bidder/ Contractor confirms that any violation by any of his partners/sub-contractors to act in conformity with the provisions of this Integrity Pact can be construed as a violation by the Bidder/Contractor himself, leading to possible Termination of Contract in terms of Section 4.

(3) The Employer will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section -7: Criminal charges against violating Bidders/Contractors/Sub-Contractors

If the Employer obtains knowledge of conduct of a Bidder, Contractor or Partners/Sub-Contractor, or of an employee or a representative or an associate of a Bidder, Contractor or Sub-Contractor, which constitutes corruption, or if the Employer has substantive suspicion in this regard, the Employer will inform the same to its Chief Vigilance Officer.

Section -8: Independent External Monitor/Monitors

(1) The Employer shall appoint competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

(2) The Monitor is not subject to instructions by the representatives of the parties and will perform his functions neutrally and independently. He will report to the MD/NHIDCL.

(3) The Bidder/Contractor accepts that the Monitor has the right of access without restriction to all Project documentation of the Employer including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Partners/Sub-Contractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder/Contractor/Partners/Sub-Contractor with confidentiality.

(4) The Employer will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Employer and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

(5) As soon as the Monitor notices or has reason to believe that violation of the agreement by the Employer or the Bidder/ Contractor, has taken place, he will request the Party concerned to discontinue or take corrective action, or to take any other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner or refrain from action or tolerate action.

(6) The Monitor will submit a written report to the MD/NHIDCL within 8-10 weeks from the date of reference or intimation to him by the Employer and should the occasion arise, submit proposal for correcting problematic situations.

(7) If the Monitor has reported to the MD/NHIDCL of a substantiated suspicion of an offence under relevant IPC/PC Act, and the MD/NHIDCL has not, within reasonable time, taken visible action to proceed against such offender or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner.

(8) The word Monitor would include both singular and plural.

(9)

Section–9: Pact Duration

This pact begins when both parties have legally signed it. It expires for the Contractor, when his Security Deposit is released on completion of the Maintenance period and for all other Bidders 6 months after the contract has been awarded.

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

Section-10: Other Provisions

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction shall be as stipulated in Contract Agreement.

(2) Changes and supplements as well as termination notices need to be made in writing.

(3) If the Contractor is a partnership or a consortium, this agreement must be signed by the Partner in charge/ Lead Member nominated as being incharge and who holds the Power of Attorney signed by legally authorised signatories of all the partners/Members. The Memorandum of Understanding /Joint Venture Agreement will incorporate a provision to the effect that all Members of the Consortium will comply with the provisions in the Integrity Pact to be signed by the Lead Member on behalf of the Consortium. Any violation of Section 2 above by any of the Partners/Members will be construed as a violation by the consortium leading to possible Termination of Contract in terms of Section 4.

(4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

NHIDCL
Agent / Power of Attorney Holder

_____

_____

(For & on behalf of the Employer) (For the Bidder/Contractor)
(Office Seal) (Office Seal)

Place: ……
Date: …….

Witness 1: (Name & Address) ----------

Witness 2: (Name & Address) ----------

ANNEXURE –IX

GUIDELINES ON BANNING OF BUSINESS DEALINGS

1. **Introduction**

1.1 NHIDCL, being a Govt. of India Undertaking and 'State', within the meaning of Article12 of Constitution of India, has to ensure preservation of rights enshrined in Chapter of the Constitution. NHIDCL has also to safeguard its commercial interests. It is not in the interest of NHIDCL to deal with Agencies who commit deception, fraud or other misconduct in the execution of contracts awarded / orders issued to them. In order to ensure compliance with the constitutional mandate, it is incumbent on NHIDCL to observe principles of natural justice before banning the business dealings with any Agency.

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

2. **Scope**

2.1 The procedure of (i) Suspension and (ii) Banning of Business Dealing with Agencies, has been laid down in these guidelines.

2.2 It is clarified that these guidelines do not deal with the decision of the Management not to entertain any particular Agency due to its poor/ inadequate performance or for any other reason.

2.3 The banning shall be with prospective effect, i.e., future business dealings.

3. **Definitions**

In these Guidelines, unless the context otherwise requires:

(i) `Bidder / Contractor / Supplier' in the context of these guidelines is indicated as 'Agency'.

(ii) 'Competent Authority' and 'Appellate Authority' shall mean the following:

(a) The Director shall be the 'Competent Authority' for the purpose of these guidelines. MD, NHIDCL shall be the 'Appellate Authority' in respect of such cases.

(b) MD, NHIDCL shall have overall power to take Suo-moto action on any information available or received by him and pass such order(s) as he may think appropriate, including modifying the order(s) passed by any authority under these guidelines.

(iii) 'Investigating Department' shall mean any Department, Division or Unit investigating into the conduct of the Agency and shall include the Vigilance Department, Central Bureau of Investigation, the State Police or any other department set up by the Central or State Government having powers to investigate.

4. **Initiation of Banning / Suspension**:

Action for banning / suspension business dealings with any Agency should be initiated by the department/ unit having business dealings with them after noticing the irregularities or misconduct on their part.

5. **Suspension of Business Dealings**

5.1 If the conduct of any Agency dealing with NHIDCL is under investigation by any department, the Competent Authority may consider whether the allegations under investigation are of a serious nature and whether pending investigation, it would be advisable to continue business dealing with the Agency. If the Competent Authority, after consideration of the matter including the recommendation of the Investigating Department/Unit, if any, decides that it would not be in the interest to continue business dealings pending investigation, it may suspend business dealings with the Agency. The order to this effect may indicate a brief of the charges under investigation. The order of such suspension would operate for a period not more than six months and may be communicated to the Agency as also to the Investigating Department.

The Investigating Department/Unit may ensure that their investigation is completed and whole process of final order is over within such period.

5.2 As far as possible, the existing contract(s) with the Agency may be continued unless the Competent Authority, having regard to the circumstances of the case, decides otherwise.

5.3 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.

5.4 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension. However, if investigations are not complete in six months' time, the Competent Authority may extend the period of suspension by another three months, during which period the investigations must be completed.

6. **Grounds on which Banning of Business Dealings can be initiated**

6.1 If the security consideration, including questions of loyalty of the Agency to the State, so warrants;

6.2 If the Director / Owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises or NHIDCL, during the last five years;

6.3 If there is strong justification for believing that the Directors, Proprietors, Partners, owner of the Agency have been guilty of malpractices such as bribery, corruption, fraud, substitution of tenders, interpolations, etc.;

6.4 If the Agency employs a public servant dismissed / removed or employs a person convicted for an offence involving corruption or abetment of such offence;

6.5 If business dealings with the Agency have been banned by the Govt. or any other public sector enterprise;

6.6 If the Agency has resorted to Corrupt, fraudulent practices including misrepresentation of facts;

6.7 If the Agency uses intimidation / threatening or brings undue outside pressure on the Company (NHIDCL) or its official in acceptance / performances of the job under the contract;

6.8 If the Agency indulges in repeated and / or deliberate use of delay tactics in complying with contractual stipulations;

6.9 Based on the findings of the investigation report of CBI / Police against the Agency for malafide / unlawful acts or improper conduct on his part in matters relating to the Company (NHIDCL) or even otherwise;

6.10 Established litigant nature of the Agency to derive undue benefit;

6.11 Continued poor performance of the Agency in several contracts;

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

7. Banning of Business Dealings

7.1 A decision to ban business dealings with any Agency shall apply throughout the Company.

7.2 If the Competent Authority is prima-facie of view that action for banning business dealings with the Agency is called for, a show cause notice may be issued to the Agency as per Paragraph 8.1 and an enquiry held accordingly.

8. Show-Cause Notice

8.1 In case where the Competent Authority decides that action against an Agency is called for, a show cause notice has to be issued to the Agency. Statement containing the imputation of misconduct or mis-behaviour may be appended to the show-cause notice and the Agency should be asked to submit within 30 days a written statement in its defence. If no reply is received, the decision may be taken ex-party.

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

8.3 After considering the reply of the Agency and other circumstances and facts of the case, a final decision for Company-wide banning shall be taken by the Competent Authority. The Competent Authority may consider and pass an appropriate speaking order:

(a) For exonerating the Agency if the charges are not established;
(b) For banning the business dealing with the Agency.

8.4 The decision should be communicated to the Agency concerned along with a reasoned order. If it decided to ban business dealings, the period for which the ban would be operative may be mentioned.

9. Appeal against the Decision of the Competent Authority

9.1 The Agency may file an appeal against the order of the Competent Authority banning business dealing, etc. The appeal shall lie to Appellate Authority. Such an appeal shall be

preferred within one month from the date of receipt of the order banning business dealing, etc.

9.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the Agency as well as the Competent Authority.

10. **Review of the Decision by the Competent Authority**

Any petition / application filed by the Agency concerning the review of the banning order passed originally by Competent Authority under the existing guidelines either before or after filing of appeal before the Appellate Authority or after disposal of appeal by the Appellate Authority, the review petition can be decided by the Competent Authority upon disclosure of new facts /circumstances or subsequent development necessitating such review.

11. **Circulation of the names of Agencies with whom Business Dealings have been banned.**

11.1 Depending upon the gravity of misconduct established, the Competent Authority of NHIDCL may circulate the names of Agency with whom business dealings have been banned, to the Ministry of Railways and PSUs of Railways, for such action as they deem appropriate.

11.2 If Ministry of Railways or a Public Sector Undertaking of Railways request for more information about the Agency with whom business dealings have been banned a copy of the report of Inquiring Authority together with a copy of the order of the Competent Authority/ Appellate Authority may be supplied.

12. **Restoration**

12.1 The validity of the banning order shall be for a specific time & on expiry of the same, the banning order shall be considered as "withdrawn".

12.2 In case any agency applies for restoration of business prior to the expiry of the ban order, depending upon merits of each case, the Competent Authority which had passed the original banning orders may consider revocation of order of suspension of business/lifting the ban on business dealings at an appropriate time. Copies of the restoration orders shall be sent to all those offices where copies of Ban Orders had been sent.

Section – 2

TENDER AND CONTRACT FORM

SECTION 2
TENDER AND CONTRACT FOR WORKS

To,
NHIDCL
(The Accepting Authority)

_____

1. I/We have read and examined the Notice Inviting Tender and Instructions to Tenderers, Conditions of Contract, Clauses of Contract, Special Conditions/Specifications, Schedule of Rates, Schedules A to F, Specifications applicable, Drawings and Designs, Schedule of Quantities, other documents and rules referred to in the Conditions of Contract and all other contents contained in the Tender Document for the work.

2. I/We hereby tender for the execution and completion of the work and remedy any defects therein, specified in the Schedule of Quantities within the time specified in Schedule "F", and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Notice Inviting Tender and Instructions to Tenderers and in Clause 11 of the Clauses of Contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

3. We agree that our tender shall remain valid for a period of 90 days from the due date of submission thereof and not to make any modifications in its terms and conditions.

4. A sum of **Rs. ---------- Lakhs (Rupees ---------- Only)** is hereby forwarded in the form of Banker's cheque/Demand Draft drawn on any Schedule Bank issued in favour of NHIDCL, payable at **New Delhi** as the Earnest Money.

5. If I/We withdraw my/our tender during the period of tender validity or before issue of Letter of Acceptance whichever is earlier or make 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 entire Earnest Money absolutely.

6. If I/We fail to furnish the prescribed Performance Guarantee within prescribed period, I/We agree that the said Employer shall, without prejudice to any other right or remedy, be at liberty to forfeit the said Earnest Money absolutely.

7. If, I/We fail to commence the work within the specified period, I/We agree that the Employer shall, without prejudice to any other right or remedy available in law, be at liberty to forfeit the Earnest Money and Performance Guarantee absolutely.

8. Further, I/We hereby agree that in case of forfeiture of Earnest Money or both Earnest Money & Performance Guarantee as aforesaid in Paras 5 to 7, I/We shall be debarred for participation in re-tendering process of the work.

9. On issue of Letter of Acceptance by the Employer, I/We agree that the said Earnest Money shall be retained by the Employer towards Security Deposit, to execute all the works referred to in the Tender document upon the Terms and Conditions contained or referred to therein and to carry out such deviations as may be ordered, upto maximum of the percentage mentioned in Schedule F, and those in excess of that limit at the rates to be determined in accordance with the provisions contained in Clause 12.2 and 12.3 of the tender form.

10. I/We hereby agree that I/ We shall sign the Formal Agreement with the Employer within 28 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.

11. I/We hereby declare that I/We shall treat the tender documents, drawings 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 of the Employer/State.

12. I/We hereby declare that I/We have not laid down any condition/deviation to any content of Technical Bid 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.

13. 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.

14. Until a formal agreement is prepared and executed, this bid together with our written acceptance thereof shall constitute a binding contract between us and NHIDCL.

15. 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.

Witness	Signature of Authorized Person/s
Signature	Date
Name	Name/s & Title of Signatory
Postal Address	Name of Tenderer
Occupation	Postal Address
	Seal

Section - 3

SPECIAL CONDITIONS OF CONTRACT

SECTION 3

SPECIAL CONDITIONS OF CONTRACT

1 **SITE FAMILIARIZATION CERTIFICATE**: - The tenderers should visit the worksite, acquaint themselves with site conditions, approach roads, availability of materials, lead of materials etc. and should submit the certificate in Proforma 4 of section 1.

2 The Contractor has to work along with other agencies in and around the area allotted for his works. He should execute all his works in complete co-ordination and co-operation with all such agencies and provide access to other agencies so that at no time either his work or the work of other agencies is stopped or delayed. In case of any dispute in this regard, the decision of Engineer-in-charge or his representative will be final and binding on the Contractor. No claim for idle labour, plant and machinery under any circumstances, will be entertained by the NHIDCL.

3 For work close to railway line, road, telephone line, power line (both underground and overhead) and structures, all precautions should be taken for ensuring that during the execution of the work no damage is caused to such assets and also no obstruction is caused to the live lines or movement of trains/road traffic.

4 **SERVICE ROAD**: - Contractor will provide service road/roads for movement of materials as per direction of Engineer-in-Charge. Contractor will also maintain these service roads in safe and fit condition at his own cost. He will however have no authority to prevent use of such roads by NHIDCL and other Bonafide contractors working at site. NHIDCL will, however, have the authority to disallow any movement on the road, which in their opinion is not in the interest of work. If the contractor fails to provide service road to the satisfaction of the Engineer-in-Charge it will be provided by the Engineer-in-charge at Contractor's cost. However, in case any such road is not required for the purpose of the work, nothing shall be deducted from contractor's payments on this account.

5 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 be final in this regard and binding on the contractor.

6 Contractor shall have no claim if the stretches /areas are not available for the construction /repair at the same time. Also, no extra time shall be permitted on this account.

7 The contractor shall provide a detailed schedule of work along with material and labour deployment on monthly basis and revise or update the same through a report quarterly basis.

8 The contractor will be required to establish a field laboratory for testing of compaction of earthwork/blanketing material, aggregates, bricks, concrete, bitumen, and other materials etc. The Contractor shall provide qualified personnel to run the laboratory for the duration of the Contract. The number of staff and equipment available must at all times be sufficient to keep pace with the sampling and testing programme as required by the Engineer-in-charge or his authorized representative.

9 The contractor shall procure all the materials well in advance so that there is sufficient time for testing of the materials and clearance of the same before using in the works. Testing of the materials i.e. concrete cubes / reinforcement steel / moorum / earth / stone dust / cement / aggregate / ballast and any other materials shall be carried out in Govt. Engineering College, National Test House, or any other approved laboratories as directed by Engineer In charge or his authorized representative and as per the frequency mentioned in QAP (Quality Assurance Plan) of NHIDCL. Cost of testing of materials shall be borne by the contractor.

10 The concreting work shall be done with proper and assured system of curing in duly identified areas with date of concreting marked in paint. In hot weather the contractor shall take relevant care to cover the work with wet gunny bags/ Hessian cloth or use continuous sprinkling of water on surface so as to keep the surface wet.

11 The contractor shall, after completion of work, clear the site of all debris and left-over materials, at his own expense to the entire satisfaction of Engineer In charge or his authorized representative.

12 Contractor should be registered with the concerned department of Employees Provident Fund Organization (EPFO). **No payment shall be released to the contractor until and unless the contractor submits the registration certificate and up to date deposit receipt of provident fund due to be deposited by him.**

13 At the time of submission of RA/Final bill a certificate shall be submitted by the contractor regarding up to date clearance of payment to his/their sub-contractors, vendors, suppliers, labour contractor etc. if any.

14 **Contractor shall submit to NHIDCL the entry challan of incoming** materials like cement, steel, Admixture, P. Way fittings, welding materials etc. for verification of Stores and record.

15 Contractor should maintain the daily cement consumption & steel consumption register. Engineer - in - charge or his representative may check the registers and the challans at any time.

16 **NIGHT WORK**: - The contractor would be required to carry out the work even at night, without conferring any right on the contractor for claiming for extra payment for introducing night working. The decision of the Engineer-in-charge in this regard will be final and binding on the contractor. Contractor shall make his own arrangement for sufficient illumination at site. Nothing extra will be paid for doing works at night.

17 **FIRST AID**: -The contractor shall maintain in a readily accessible place first aid appliance including an 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.

18 The contractor shall also provide, fix & be responsible for the maintenance of all stakes, templates profiles, levels marks, points etc. and must take all necessary precautions to prevent these being removed altered or disturbed and will be held responsible for the consequences of such removal, alteration or disturbances should the same take place and for their efficient reinstatement.

19 **HANDING OVER OF SITE**

19.1 Efforts will be made by the Employer to hand over the site to the Contractor free of encumbrance. However, in case of any delay in handing over of the site to the Contractor, the Employer shall only consider suitable extension of time for the execution of the work. It should be clearly understood that the Employer shall not consider any other compensation whatsoever on this account viz. towards idleness of contractor's labour equipment etc.

19.2 The Employer reserves the right to hand over the site in parts progressively to the Contractor. The Contractor will be required to do the work on such released-fronts in parts without any reservation whatsoever.

19.3 The access roads near, to the work site may not be available at the time of Mobilisation by the Contractor. The Contractor shall plan his work within the plant area as per available roads at site. All drainage of works area and all other weather truckable/haulage roads as required by the Contractor shall be constructed and maintained during the construction period by the Contractor at his own cost.

19.4 The Contractor has to make temporary diversion of course of water during execution of any work conveniently free of cost.

19.5 **An experienced Surveyor should be deployed at site by the contractor along with Total Station or equivalent equipments**. Nothing extra will be paid for deploying experienced Surveyor or equipments.

19.6 The Contractor will bear all the charges of design mix and the charges for testing of materials.

19.7 Contractor will have to arrange water supply and electricity connection at his own expenses for his own establishments.

19.8 Contractor's rate shall be inclusive of cost of dewatering/shoring wherever required. No extra payment shall be made for any type of dewatering/shoring during execution of the work.

20 The tenderer shall hold the offer open till such date as may be specified in the tender. It is understood that the tender documents have been sold/issued to the tenderer and the tenderer is being permitted to tender in consideration of the stipulations on his part that after submitting his tender, he will not resile from his offer or modify the terms and conditions thereof, in a manner not acceptable to NHIDCL.

21 If a tenderer expires after the submission of his tender or after the acceptance of his tender, NHIDCL shall deem such tender as cancelled. If a partner of a firm expires after the submission of their tender or after the acceptance of their tender, NHIDCL shall deem such tender as cancelled unless the firm retains its character.

22 NHIDCL also reserves the right to accept tender either for full quantity of work or part thereof or divide the works amongst more than one without assigning any reason for any such action.

23 When the tender is submitted by the tenderer(s), it will be understood that the tenderer(s) has/have gone through carefully in detail all the instructions, conditions, General and Special conditions of contract all General and Special instructions/ specifications for execution of the work and that the tenderer(s) has/have got himself/ themselves clarified on all points and doubts and interpretations by the proper authority of NHIDCL Administration.

24 Contractor's store houses, yards etc. for stocking materials issued by NHIDCL shall be located in the site premises only at locations approved by Engineer-in-charge.

25 The Laying & linking of railway track work consists of linking/laying of track, PSC sleepers and Points & Crossings including supply of hard stone ballast (machine crushed) of approved quality and other P. way materials.

The work shall conform to various specification indicated in Indian Railway P. Way Manual, Track Manual and other Permanent Way I.R.S. Drawings in use by Indian Railways for such works, and should be fit for use of Broad-Gauge Engines, Rolling Stock etc.

26 If there is any conflict between description given in schedule of quantity & conditions mentioned in the special conditions, the schedule of quantity shall prevail.

27 Deleted.

28 After handing over of the existing section to the contractor, the same section will be maintained and guarded by the contractor, till all the works are completed in all respect and handed over back to the Engineer-in-charge.

29 The P. Way materials as per "Schedule of Quantities" in the tender documents required for the work and to be supplied by the Contractor as per BOQ shall have to be supplied from RDSO approved manufacturers duly inspected by Railways/RDSO/NHIDCL.

30 All P. Way materials (Rail, Sleeper & Fittings released from existing Siding shall be stacked at one location and jointly surveyed with NHIDCL before disposal as per scheduled item.

31 Adequate protection should be made while moving on public Roads or adjacent and across railway tracks. The rates quoted shall include cost of such items.

32 No wastage, breakage allowance or loss is permitted for fixing of P. Way fittings and materials supplied by the contractor.

33 It should be clearly understood that it is entirely the contractor's responsibility and liability to find, procure and use the required tools and plants and accessories at his own cost for efficient and methodical execution of the work. NHIDCL shall have the right to check the sufficiency or quality of the Contractor's tools from time to time and the Contractor shall carry out all reasonable instructions of NHIDCL in this respect.

34 The quantities shown in the attached Schedule are given as a guide and are approximate only and are subject to variation according to the needs of the project. NHIDCL does not guarantee work under each item of the Schedule. The Contractor shall be bound to carry out the work at the agreed rates and shall not be entitled to any claim or any

compensation whatsoever up to the limit of 25% variation in quantity of individual item of work.

35 **Drawings for the Work**: The Drawing for the work can be seen in the office of the General Manager (Technical)/NHIDCL/New Delhi or RO/NHIDCL/Guwahati at any time during the office hours. The drawings are only for the guidance of contractor. Detailed working drawings& Design shall be prepared by contractor & got approved from competent authority.

36 The labour engaged by the contractor for the works should be headed by a railway retired Permanent Way Inspector, employed by the contractor, who is conversant with the execution and maintenance of P. Way works including safety rules.

37 Released P. Way materials will continue to remain in the custody the contractor till joint verification is done with NHIDCL. The contractor shall employ security/chowkidars day and night at his own cost till final disposal.

38 Shifting of labour camp from place to place as the work advances will be at the cost of the contractor.

39 The contractor will co-operate with the Engineer-in-Charge in maintaining various registers, charts and records etc. in connection with the works.

40 NHIDCL representative will sign and maintain the following registers and the Contractor or his authorized representative must sign on the registers as a token of his acceptance of the entries made therein.

- Register of site order.
- Register of materials laid in track.
- Register of ballast stacks.
- Register of through packing.
- Register of miscellaneous items, etc.
- Others relevant registers.

41 A separate register should also be maintained by the contractor for the deployment of contract labour at site. The registers should be made available to NHIDCL personnel, as and when required.

42 While stacking P. Way materials (new or second hand or released) on cess/side, care should be exercised to ensure that those stacks do not infringe the Railway's moving dimensions.

43 The work of track linking at existing level crossings will be taken up only when specifically authorized by NHIDCL representative after giving due notice to road users. The road surface will be made good on completion of works at contractor's cost, to the original standard. No extra payment for digging up road surface for the work and restoring the road surface will be admissible for work at level crossings.

44 Time shall be regarded as the essence of the contract and failure on the part of contractor to complete the work by the date stipulated in the agreement and work order will entitle NHIDCL Administration to recover liquidated damages/penalty.

45 NHIDCL Administration reserve the right to alter the detailed plan and sections and to carry out minor alteration in the plans resulting in corresponding increase or decrease in the quantity of works without being liable to pay enhanced rates for the work or to allow extra time for completion of the work.

46 No new facilities such as roads, level crossing etc., other than those already in existence will be made available to the contractor.

47 The Schedule of items of work to be carried out, provided in the SCHEDULE OF QUANTITIES" gives only brief description of each of the items. Execution of these items will be governed by the **Technical specifications**. **For detailed specifications reference may be made to Section 5 "Technical Specifications" in general and in particular to the various Guidelines and Specifications listed in Para 1.0 "Preamble to Technical Specification" of Section 5**. NHIDCL's representative at site will be fully empowered to provide guidance in the matter of execution of the works and his instructions will be final and binding in this regard.

48 In case any workman is found incompetent or otherwise undesirable by the NHIDCL's representative at site, he should not be allowed to work under the Contractor. In this matter, the opinion of the Engineer-in-Charge will be final and binding on the contractor. Any violation of this requirement by the Contractor shall be treated as fundamental breach of contract entitling NHIDCL to rescind the contract by giving 7 days' notice.

49 Particulars of work done during each day, with location where the work is done, will have to be recorded in a register by the Contractor's site in charge and the register will be kept available for inspection/scrutiny by NHIDCL's representative. A site order book will also have to be maintained where instructions regarding work to be carried out will be recorded by NHIDCL's representative at site.

50 NHIDCL's representative shall have the right at all times to 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. For this purpose, contractor shall maintain a site

order Book. Failure to comply with NHIDCL's representative's instructions shall be deemed to be a fundamental breach of contract entitling NHIDCL to rescind the Contract at the Contractor's risk and cost after serving a notice of 7 days.

51 On-account payments to Contractor shall be made periodically based on the quantity and item of work executed at the rates accepted under this contract, and upon a certificate by the NHIDCL's representative that work has been done to proper specification and to the satisfaction of its representative.

52 The Contractor will make all arrangements for getting passes/authorities for his men including making necessary application with photos for each labourer deployed for this work and will bear all costs, if any. Housing accommodation and watering arrangements for contractor's labour will have to be arranged by the contractor.

53 Every month the Contractor will issue a Certificate to NHIDCL about having made full payment to all laborers/suppliers/vendors under him engaged for this work.

54 The Contractor will bear all medical expenses and make immediate arrangement for medical attention to his labourer, if injured on duty. He will provide "Medical Aid" Box at site of work at his cost.

55 The contractor should indemnify and save harmless NHIDCL/Client against any claims on account of accident to laborers similar occurrence for any reason whatsoever.

56 Payment to contractor shall be released after submission of proof of GST payment.

57 The rates quoted shall be inclusive of all taxes such as GST, entry tax, toll tax, turnover tax on works contract, octroi, royalty, VAT, Labour Welfare Cess and any other tax, levy, cess etc. as applicable. Inspection charges and the charges for loading, transportation, unloading and stacking of materials at store should not be quoted separately. The quoted rates should remain firm till completion of the entire work.

58 **The contractor shall submit royalty clearance certificate** wherever applicable along with on account bill/running account bill. If the contractor fails to submit the royalty certificate, requisite amount will be deducted as per extant Govt. rule, from his bill be deposited with the concerned department.

59 STORES TO BE SUPPLIED BY THE CONTRACTOR

(a) All the P. Way items should be as per RDSO Drawing Numbers and shall comprise of all parts and accessories listed in the Drawing except where

otherwise stated. **All P. Way fittings should be procured from RDSO approved manufacturers only.**

(b) The quoted rates should be inclusive of Inspection Charges and all taxes and duties of Central, State, Local bodies including Loading, transportation, unloading and stacking at site &store. The quoted rates shall remain firm during the currency of the Contract.

(c) Actual quantity delivered at site will be considered for the purpose of effecting payment.

(d) Inspection of all Track materials is to be carried out by RITES, RDSO or Zonal Railways with which the factory is tied up, as the case may be, before effecting dispatch of the materials. Inspection certificates and the original money receipt of the Inspection Wing/Zonal Railways will have to be submitted along with the bills as documentary evidence.

(e) NHIDCL reserves the right to undertake any test, if required, before acceptance of the materials on contractor's cost.

(f) Any materials and accessories, found to be damaged at the time of receipt will not be accepted and shall have to be replaced by good ones free of cost after being duly inspected.

60 **Defect Liability Maintenance/Defect Liability Period**: As per clause 17 of clauses of contract in GCC applicable to this work, the period of maintenance/defect liability period for this work shall be 24 (twenty four) months from the date of issue of final completion certificate or till the final bill has been passed whichever is later.

61 **APPLICATION OF PRICE VARIATION CLAUSE 10CC OF CLAUSES OF CONTRACT**

For supply of P. Way Materials under Schedule 1 of BOQ (Part 2 – Financial Bid – Schedule of Quantities), the rates quoted will be firm for each item and NO Price Variation under Clause 10CC of Clauses of Contract will be admissible.

62 **Completion Drawing:**

Completion drawings for the works executed shall be prepared by the contractor at his cost on tracing paper. The contractor will supply five copies of ammonia print of completion drawing duly signed along with original tracing plan with the final bill.

63 Secured advance, Mobilization advance will not be paid. As such relevant GCC clause to be treated as deleted.

64 The work shall be executed under the supervision of an Independent approved consultant of N.F. Railway as per Railway norms. The approved consultant shall be appointed by contractor & got approved from NHIDCL. The cost of the same shall be borne by the contractor.

Section - 4

SPECIAL CONDITIONS FOR SUPPLY OF BALLAST

SECTION 4

SPECIAL CONDITIONS FOR SUPPLY OF BALLAST

1 The rates, as per the Schedule, are inclusive of all taxes viz. GST, octroi etc. and other charges levied by the State / Central government. The rate also includes all lead, lift, ascent, descent, loading, unloading, royalty etc. and all other incidental charges.

2 The contractor shall stack the ballast, normally over the entire length of the section at specified locations duly certified by the Engineer-in-Charge except at those certain locations which are found to be inaccessible for certain reasons. The decision of Engineer-in-Charge at site will be final and binding on the contract for the locations, inaccessible for supply of ballast.

3 The ballast shall be supplied as per the requirement given by the In-Charge at site.

4 **The ballast shall be in conformity with "Specifications for Track Ballast" (Enclosed).**

5 The tenderer must submit the test report of impact value, Abrasion value and water Absorption value from any of the approved laboratories along with the tender indicating the name of quarry/quarries from where supply is intended.

(i) Any Zonal Railway Laboratory or any Railway approved Laboratory/ Institution.
(ii) National Test House, Alipore, Kolkata
(iii) NHIDCL Laboratory (where available),
(iv) Any Govt. laboratory/institution
(v) **The test report should not be more than 90 (ninety) days old from the date of opening of the tender.**

6 The tenderer/contractor undertakes that the ballast supply at all times shall conform to RDSO Specifications of Track ballast.

7 The contractor shall make his own arrangement at his own cost for the construction of service roads within the **Project site** as well as outside **Project site** for transportation of ballast, if required. No separate payment shall be admissible to the contractor for the construction of such roads and its repairs & maintenance.

8 The contractor shall have to make necessary arrangement for levelling the nominated grounds for stacking of ballast at cess, as per the direction and to the satisfaction of Engineer-in-Charge, without any additional claim of payment.

9 The contractor shall submit the name of the quarry/quarries along with the tender from where the contractor is intending to supply the ballast.

10 The cost of routine testing of ballast, as per RDSO guidelines shall be payable by the contractor. However, the NHIDCL is at liberty to collect the ballast sample as and when, required and send the same for testing at the cost of Contractor.

11 The quantities of ballast mentioned in the schedule are approximate. NHIDCL reserves the right to alter the quantity as per the actual requirement and nothing extra will be payable over and above the accepted rates.

12 The contractor shall make necessary arrangement for the security of the ballast supplied during the progress of the work till final bill is paid. No separate payment shall be admissible to the contractor for guarding the ballast.

13 The ballast shall be supplied as per the requirement given by the Site Engineer. Quantity supplied extra over the required quantity may not be paid.

14 Safety of ballast against any theft or loss remains solely with the contractor during the entire period of the contract agreement and the same has to be made good by contractor. This responsibility of the contractor remains even if the ballast stacks are measured and paid for, unless NHIDCL/EMPLOYER takes over measured ballast stacks from the contractor with a clear taking over certificate.

15 The **Stone ballast should be machine crushed** and shall consist of hard and durable and as far as possible angular along edges/corners, free from weathered portions of parent rock, organic impurities and inorganic residues. Along with the tender the Tenderer test certificate for physical properties in accordance with IS: 2386 (Part-IV)-1963 that shall be supplied by him.

16 The Tenderer should mention in the tender the name of quarry from where the ballast is proposed to be supplied and the distance of the quarry from site.

17 The stone ballast should be got inspected by the Engineer at regular intervals to ensure quality and samples tested for physical properties (abrasion test, impact test and water absorption test values).

18 Attempts should be made to have ballast of the best available quality& should be procured from approved quarry as per RDSO guide lines.

19 90% of the payment will be paid in R.A. bills prepared against supply of ballast duly certified by Engineer-in-Charge of NHIDCL supported with measurement details, test certificates, royalties and all other necessary statutory taxes clearance certificates. Balance 10% shall be released after spreading the same in Track

20 The rates in this schedule are entirely inclusive so as to cover any purchase and/or royalties and / or compensation for surface charges incurred by him whatsoever. The accepted rate includes all quarry charges and other charges if any and tools and plants for clearing site for stacking, test and testing screens, carriage of materials to the site of stacking and removal of any material rejected by the Engineer.

21 The rates quoted are inclusive of all charges including all taxes levied by Union of India or State Government or local bodies and include GST, Royalty, Octroi duties etc.

Section - 5

SPECIAL CONDITIONS FOR THERMIT WELDING

SECTION 5

SPECIAL CONDITIONS FOR THERMIT WELDING

The work consists of welding in situ 52 Kg. rail (72 UTS/90 UTS) joints by Short preheat welding (SKV welding) process.

1. The 'portion' used for welding shall conform to the technical requirements as mentioned in IRS: T-19-1994. The suitability of the 'portion' for the welding process in respect of the type and section of rails to be welded shall be ensured before commencing welding. Only RDSO certified/passed portions should be used for welding.

2. The contractor shall execute the work at the rates and terms and conditions specified in the contract and within the time schedule as indicated in the Work Orders.

3. The work done shall conform to IRS Specification No.T-19-1994 for fusion welding of rails by Alumino Thermit process. A copy of this specification is attached as Annexure "A" stipulation laid down therein shall apply to this except as modified or clause herein under.

4. No payment will be made for the spoilt joint if exceeds 2% of the total of good joints.

5. Cost of Rail pieces for making Test welds specified in clause 3.5.1 of the Annexure-"A" shall be borne by the contractor. Nothing extra shall be payable on this account.

6. A guarantee as specified in clause 3.6.1/3.5.2 of Annexure shall be furnished by the contractor for the completed weld joints against Work Order.

7. The marking of welded joints as specified in clause 3.6.3 of the Annexure "A" shall be done by the contractor at his cost.

8. The contractor shall procure all the necessary welding materials as well as all the equipments, tools for the welding works so as to use a finished weld including the necessary plant & equipments at his own cost and he will be paid only for the finished work at rates quoted in the Schedule of items.

9. The contractor shall provide all labour required for the work and the contractor shall arrange to train the labour in the welding technic and shall also be responsible for providing constant technical supervision during the process of welding work. The welder should be RDSO trained and certified by RDSO. The welders certificate obtained from RDSO shall have to be furnished prior to start of work for welding.

10. The contractor shall be responsible for the correct alignment and welding of the rails and for the proper plain by hand filing of the welds and their finish. The files are to be supplied by the contractor at his cost.

    (a) The contractor shall provide pieces of wooden sleeper wedges and such other tools which are required for lifting or making or placing rail in position for welding purpose and also hammer and hot and cold sets required for the works.

    (b) The contractor shall provide fuel like petrol required for welding at the rate of 2.00 litres of petrol per joint. The quantities may vary within 10%.

    (c) All other equipments &machineries used by the contractor in grinding or plaining etc. should be worked out by him at his own cost including labour for this work.

11. The contractor shall arrange his own facilities for carrying out of all plants & equipment and materials from nearest store to site of work.

12. The Contractor shall arrange storage accommodation for his plants & equipments as close to the site of work.

13. The contractor shall not carry out any works between sunset and sunrise. He should make his own arrangement to protect the work against wind and weather in the course of execution of work.

14. Payment shall be made for acceptable joints in terms of the agreement and for the spoilt joints upto 2% of the total of good joints. Further joints which will be put for tests, the contractor will be paid provided they stand the test. Test joints which will be failed will not be paid for.

15. The rate for welding work shall be inclusive of all Taxes.

16. The contractor shall be responsible for the welded joints remaining satisfactory for the guarantee periods as specified in Annexure-"A" and every joint failing during this period 3 times the cost of one weld will be recovered from the amount due to him, if it is decided by NHIDCL that the cracked welded joint will not be re-welded free by the contractor in terms of clause 3.5.2 of Annex-"A".

17. The account of sealed approved portions and statement of issue of approved portion shall be maintained by NHIDCL’s representative of the welding but the account and statement in question will have to be countersigned by the authorised representative of the

contractor. The account shall correlate the welding panel on the pieces number with the approved portion and the date of welding.

18. In the event of failure of weld joints which are not possible to weld on that very day, the joints must invariably be fastened with joggled fish plates duly clamped. The joggle fish plates and clamps are to be arranged by the contractor at his own cost.

19. The plants, equipments, consumables materials, Technical Supervisors, Artisan staff, Welders and other labours required for the work shall have to be arranged by the contractor at his own cost.

20. Any electric supply required at site for what-so-ever purpose shall be arranged by the contractor at his own cost and rates quoted shall include the cost of providing electric supply arrangements required for the work.

21 **Sample Test Joint**

21.1 One out of every 100 joints welded shall be selected at random by the purchaser or by the inspecting officer within one month of welding & subjected to Hardness, Transverse load / deflection test & Porosity as per clause 4.2 of IRS T-19-1994 (reproduced as Annexure 9 for ready reference) and the joint shall comply with the provisions laid down therein.

21.2 If the sample test joint fails to satisfy any of the requirements of specification IRS-T-19-1994, NHIDCL will be at liberty to suspend further welding. However, two more randomly selected joints from the same lot of 100 joints shall be subjected to re-tests as per clause 1.1 of IRS-T-19-1994. Both the joints should clear all the tests. If this report is also not satisfactory, further welding of joints shall be suspended until the firm's welding technique has been examined and the same satisfies the requirements of IRS: T-19-1994.

22 **Guarantee**

22.1 Rail joints welded by a firm shall be guaranteed against failure for a period of one year from the date of welding the joints in track or from the date such welded joints made 'in cess' are inserted in the track. Any such welded joint which fails within the guarantee period shall be re-welded free of cost by firm as per stipulations of para 3.4 of Annex-"A".

22.2 In case of failure of sample test joint (refer para 3.5 of Annex-"A".), the period of guarantee for 100 joints represented by the sample joint shall be extended for a further period of one year. In case of failure of joints or joints exhibiting signs of failure by

cracking within extended period of guarantee, the joints shall be re-welded free of cost by the supplier as per stipulations of para 3.4 of Annexure-"A".

22.3 The welded joints with the extended period of guarantee shall be marked 'X' with yellow paint one the outer side of the web of the rail near the joint in addition to the marking prescribed in para 2.6 of Annex-"A". Such marked joints shall be kept under careful observation by the purchaser.

Section – 6

SCHEDULES
(A TO F)

SECTION 6

PROFORMA OF SCHEDULES

(Operative Schedules to be supplied separately to each intending tenderer)

SCHEDULE 'A'

Schedule of Quantities (As per Bill of Quantities attached in Part 2)

SCHEDULE 'B' – Schedule of material to be issued to the contractor

NOT APPLICABLE

SCHEDULE 'C' – Tools & Plants to be hired to the contractor

NOT APPLICABLE

SCHEDULE 'D'

Extra schedule for specific requirements/documents for the work, if any.

NOT APPLICABLE

SCHEDULE 'E' – (CLAUSE 46A)

Schedule of component of Cement, Steel, other materials, POL, Labour etc. for price escalation. (Refer Clause 10CC of Clauses of Contract).

Component of Cement (Xc) expressed as percent of total value of work		Not applicable
Component of steel (X5) expressed as percent of total value of work		Not applicable
Component of other materials (XM) (except cement & steel) expressed as per cent of total value of work		Not applicable
Component of labour (Y) expressed as percent of total value of work		Not applicable
Component of P.O.L (Z) expressed as percent of total value of work		Not applicable

SCHEDULE 'F'

Reference to General Conditions of contract

Name of Work -		Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt. - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP
Estimated cost of work -		**Rs.22.45 Crore**
Earnest money	(Pt I Clause 5)	**Rs.12.72 Lakhs**
Performance Guarantee	(Pt II Clause 16(4)	5% of Tendered value
Security Deposit:	(Pt II Clause 16(1)	5% of Tendered value
Notice Inviting Tender and Instruction to Tenderers		General Manager (Technical), NHIDCL
Officer Inviting Tender		NHIDCL **(A Govt. of India Undertaking)** **3rd Floor, PTI Building, 4 Parliament Street, New Delhi - 110001**
CONDITIONS OF CONTRACT Definitions		
Employer		NHIDCL
Employer's Representative		**General Manager (Technical) NHIDCL, New Delhi (Authorized Representative)**
Engineer-in-Charge		The Person to whom the Engineer-in-charge entrusts as his authorized representative his responsibility to act on his behalf and perform any or all the functions of the Engineer-in- charge under the Contract.
Accepting Authority		**NHIDCL (Tender Accepting Authority)**
Percentage on cost of materials and labour to cover all overheads and		15%

profits.		
Standard Schedule of Rates		**Indian Railways Unified Standard Schedule of Rates (Labour & Material), 2019**
Standard Contract Form		NHIDCL Tender and Contract Document
CLAUSES OF CONTRACT		
Time allowed for submission of P.G. from the date of issue of Letter of Acceptance		21 days
Maximum allowable extension beyond the period provided above		10 days
Authority for fixing compensation under		General Manager (Technical) /NHIDCL/ New Delhi
Time allowed for execution of work:		**16 (Sixteen**) months from the 15th **day** after the date of issue of Letter of Acceptance or from the first day of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the Tender Documents.

TABLE OF MILESTONE(S):

S. No.	Financial Progress	Time allowed in days (cumulative)	Amt.to be withheld in case of non-achievement of milestone
1	Formation work	D+6 Months	In the event of not achieving the stipulated progress as observed at site, 1% of the Tendered value of the work will be withheld for failure of each milestone.
2	Bridge work	D+12 months	
3	Road work	D+12month	
4	Supply of Ballast & P. Way fittings including linking work	D+16 months	

Note: Table of Mile Stone may be changed due to Site Condition during execution of works.

Specifications to be followed for execution of work	**Earth Work in Formation** (a) RDSO Guide line on Earth work (GE 1) (b) IR Unified Standard Specification 2019

		(c) NFR Standard Specification **Bridge Work** (a) IR Unified Standard Specification 2019 (b) NFR Standard Specification (c) All relevant IS codes **P. Way Linking Work** (a) IR Unified Standard Specification 2019	
List of mandatory machinery, tools & plants to be deployed by the Contractor at site: -		Excavator, Dumper, Vibro Roller, Dozer, Concrete Mixer, AT Welding Equipments, Track Tools, USFD Machine, etc. Testing of samples may be permitted at NABL Accredited Laboratory	
Appellate Authority:		RO / Guwahati	
Appointing Authority:		ED / NHIDCL / New Delhi	
Minimum Qualifications & Experience required and Discipline to which should belong Principal Technical Representative of Contractor –			
Designation	**Minimum Qualification**	**Minimum working experience**	**Discipline to which should belong**
Principal Technical Representative	BE/B.Tech Civil from any recognized college/university as approved by AICTE	05 years	Civil
Deputy Technical Representative	Diploma in Civil Engineering from any recognized college as approved by AICTE	03 year	Civil
Clause 36 (iv) Recovery for non-deployment of Principal Technical Representative and Deputy Technical Representative			
Designation		**Rate of recovery per month (in Rs.) for non-deployment**	
Principal Technical Representative		Rs.55,000/-	
Deputy Technical Representative		Rs.45,000/-	
Schedule/statement for determining theoretical quantity of cement & bitumen		IRUSSOR	
Variations permissible on theoretical quantities:			
(a) Cement – for works with estimated cost put to tender not more than Rs.5 Lakhs		Nil	

- for works with estimated cost put to tender more than Rs.5 Lakhs	Nil
(b) Bitumen for all Works	Nil
(c) Steel Reinforcement and structural steel sections for each diameter, section and category	Nil
(d) All other materials	Nil

RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION

Sl. No.	**Description of Item**	**Rates in figures and words at which recovery shall be made from the Contractor**	
		Excess beyond permissible variation	**Less use beyond the permissible variation**
1	Cement	**NOT APPLICABLE**	
2	Steel Reinforcement		
3	Structural Sections		
4	Bitumen issued free		
5	Bitumen issued at stipulated fixed price		

Site Office for the Employer to be made available by the contractor to be stipulated	**Not Applicable**
City of Jurisdiction of Court	**New Delhi**
City of Jurisdiction of Court for all matters	**New Delhi**
Sum for which Third Party Insurance to be obtained.	**Rs.5.0 Lakhs** per occurrence with the number of occurrences limited to four.

Section - 7

SCOPE OF WORK & PAYMENT SCHEDULE

1. ABOUT THE PROJECT

The development of Multi Modal Logistics Park at Jogighopa comprises of three Key components

(1) 190 acres of Multi Modal Logistics park at Ashok Paper Mill site

(2) External Road and Rail connectivity to the logistics park and Inland water terminal

(3) 40 acres of Inland water terminal (IWT)

The project will be developed in two phases. **Phase-I** will be 102 acres of Logistics park along with the external road and rail connectivity between Logistic park and IWT. Remaining 88 acres of logistic park and 40 acres of IWT will be developed in **Phase-II**.

1.1 Project Packaging

In order to initiate the development work at site, NHIDCL has decided to invite tenders for Phase-I development only. The Phase-I has been divided into three packages.

(A) **Package-1**: For all road works i.e. external and internal and development of utilities of main line on **EPC mode**. The following works are to be developed under **Package I**.

(a) External truck connectivity with MMLP

(i) MMLP Connecting Road as green field alignment from 0+000 chainage to 1+400 chainage.

(ii) Improving and upgradation of MMLP Connecting Road from chainage 1+400 to 2+835 chainage as per design specifications and standards outlined in **Schedule–D.**

(iii) Improving and upgradation of Port Connecting Road from chainage 0+000 to 1+155 chainage as per design specifications and standards outlined in **Schedule–D.**

(b) Internal Infrastructure Development as below

(i) Rigid Pavement as internal roadwork including culverts, etc.

(ii) Storm water drainage system along the road

(iii) Intake works at Brahmaputra river

(iv) Rising Main from Intake to WTP inside MMLP site
(v) Potable, Fire and recycled water supply network along the road
(vi) Sewerage system including plot connectivity along the road
(vii) Power supply network along the road
(viii) Street lighting along the road
(ix) Data & telecommunication along the road
(x) Landscaping work along the road

(B) **Package-2**: For MMLP facility on **EPC mode** for following:

(a) Outer boundary wall for 190 acres land including gates
(b) Plinth level boundary wall along with filling of plots upto plinth level ready for construction of warehouses etc.
(c) Administrative building, custom office, electric sub station
(d) Water and sewage treatment plant
(e) Plot connection from main service line of Potable, Fire and recycled water supply network
(f) Landscaping works at green area
(g) Rain Water Harvesting System
(h) Solid Waste Management

(C) **Package-3**: Construction of embankment for main track and siding of railway line upto top of the embankment ready for laying of ballast, sleepers and track on **Item Rate Contract**.

2. SCOPE OF WORKS

Under Package-3 of Phase-I, the Contractor shall undertake the supply, installation, testing and commissioning of the Civil, Structure and Track works of the Railway siding from Jogighopa Railway Station Yard to MMLP Yard. The work includes connectivity with Railway Yard as per Alignment plan from Ch. 0/0 (Jogighopa Yard) to Ch. 3700 (MMLP Yard).

Following are the main components of Works to be executed by the Contractor: -

(a) Earthwork in Formation (As per Schedule)

Earthwork in formation, as per approved plan and profile of the alignment should be done as per the RDSO Guidelines and Specifications. Earthwork in formation shall include:

- Earthwork in embankment, cutting including compaction, provision of longitudinal and cross drains, protection work and pitching on the approaches of bridges wherever required, turfing on embankment / cutting slope etc.
- provision of blanket on formation, compacted mechanically as per the cross sections and methodology approved by the Engineer.

(b) Construction of VUP (As per Schedule)

The works include construction of RUB at two locations. Scope of work also includes construction of approach roads for the RUBs and connecting to the adjacent roads. The necessary road diversions required in connection with construction of RUBs and modification of the existing level crossing shall also be part of the scope of work. The responsibility of obtaining necessary sanction/ clearance of the concerned authorities before undertaking the work rests upon the Contractor

(c) Level Crossings (As per Schedule)

The work includes extension of existing IR level crossing near Jogighopa Station and re-profiling of approach road as per site requirement. All necessary modification to the existing level crossing gates of IR as also construction of new infrastructure and diversion of road, if any, shall be under scope of this work. However, Modification/Relocation of the lifting barriers on the existing Level Crossings including interlocking shall be done by another agency.

(d) Track Laying (As per Schedule)

Supply & Installation of Siding Track shall generally be based on the provisions contained in Indian Railways Permanent Way Manual, Track Manual, & relevant IRS specifications with latest amendments/corrections.Permanent WayWork includes supply and fixing of 52Kg IU/SH 3 Rail Panel on PSC Sleepers Elastic Fastenings 1540 / Km laid on 250/300mm Ballast cushion, Supply of 60/52Kg Turnouts & its installation on PSC Sleepers as per approved RDSO drawing, Derailing switches, insulated glued joints, track signages, welding of rails, buffer stops, supply and spreading of ballast etc. complete to make the track fit for Traffic. Track shall be laid and tamped to the required Geometry & Ballast profile with Contractor's Tools / equipments. Scope of work will also include commissioning of Track

(e) Dismantling of Existing Track (As per Schedule)

Dismantling of existing 90R Rails laid on CST-9 Sleeper & stacking of released track material at nominated place including disposal of the same after assessing the quantity by weighment.

(f) Supply & installation of In-Motion Weigh Bridge

Supply, installation, erection testing & commissioning of 120T Electronic Pit less 52Kg Rail In-Motion Weigh Bridge as per the approved manufactures specification & latest RDSO specification including calibration, testing, commissioning, & obtaining all necessary approvals from competent authority after test wagon run & maintenance for one year from the date of commissioning.

3. Payment Schedule

3.1 Earthwork

Running on account payments will normally be made only for such length of banks as in the opinion of the Engineer-in-Charge have been finally executed in terms of the conditions of contract. Such on-account payment will be made to the extent of only 60% of the total quantity of earthwork. Balance 40% shall be paid after compaction and approval by Engineer-in-Charge. Contractor shall submit **royalty clearance certificate along with Running Account Bill**, if the agency fails to submit the royalty clearance certificate, the required amount will be deducted as per extant Govt. rule, from his bill and will be deposited with the concerned department.

3.2 Ballast Supply

60% payment shall be released on the net quantity accepted, 30% shall be released after spreading and 10% shall be paid after final ballast profiling.

3.3 Supply of Track Materials

60% payment will be made against delivery of materials at site and on submission of bills along with the receipt / delivery challan, Inspection Certificate. The bills in triplicate are to be raised in favour of NHIDCL and are to be submitted to Site-In-Charge. Balance 30% payment of Rails, Sleepers and P. Way fittings shall be released after installation in Track. 10% shall be released after completion of work and approval of Engineer-in-Charge.

3.4 Welded Rail Joints

Payment shall be made for acceptable Joints in terms of the agreement after testing of Joints as per Thermit Welding Manual.

3.5 Other Items

Running on account payments for all other scheduled items will normally be made only for such length / quantity as in the opinion of the Engineer-in-Charge have been finally executed in terms of the conditions of contract. Such on-account payment will be made to the extent of only 90% of the total quantity. Contractor shall submit GST Payment **certificate along with Running Account bill**, if the agency fails to submit the above certificate, the required amount will be deducted from his bill and will be deposited with the concerned department. Balance 10% shall be released after completion of work and approval of Engineer-in-Charge.

Section - 8

TECHNICAL SPECIFICATIONS
AND QUALITY ASSURANCE PLAN (QAP)

TECHNICAL SPECIFICATIONS FOR EARTHWORK IN RAILWAY FORMATION

TECHNICAL SPECIFICATIONS FOR EARTHWORK IN RAILWAY FORMATION

1.0 GENERAL

1.1 The Technical Specifications to be followed for Earthwork in Railway Formation including in Cuttings and Embankments shall be as stipulated in enclosed **Annexure A**.

1.2 The Specifications at **Annexure A** should be read in conjunction with the Schedule (Bill) of Quantities. Where there is conflict between the provisions in **Annexure A** and in BOQ, the provisions in BOQ shall prevail.

ANNEXURE A

EARTHWORK IN RAILWAY FORMATION

1.1 EARTHWORK - GENERAL

1.1.1 **RDSO Guidelines:** For survey, design and execution of earthwork in railway formations, RDSO has issued detailed guidelines as "Guidelines for Earthwork in Railway Projects – Guideline No. GE: G-1" in July 2003. These Guidelines including their subsequent amended/revised versions, if any, shall apply to execution of earthwork in railway formations. These guidelines or their amended/revised versions have subsequently been referred to in this chapter as 'RDSO Guidelines'. In case of any conflict between provisions of this chapter and those of RDSO Guidelines, the latter shall prevail.

1.1.2 **Site Clearance: -** Before work is started, the whole area between the toes of banks or tops of cuttings plus 1m additional width on both sides shall be properly and effectively cleared by the contractor of all vegetation, small trees of girth upto 30 cm (measured at a height of 1m above ground level), roots, bushes, heavy grass etc.; The Contractor shall also clear the site of all buildings, abandoned structures etc. as directed by the Engineer, for which extra payment will be made. The Contractor shall arrange removal of rubbish and other excavated material excluding earth upto a distance of 100 metres outside the periphery of the area under site clearance. Top soil obtained from site clearance as well as top layer of borrow pits which is rich in organic content and suitable for plant growth, if directed by the Engineer, may be stored for covering slopes of embankment and cuttings after construction. High portions of the ground shall be cut down and hollow depressions, if any, filled up with suitable excavated soil duly compacted and the ground dressed and levelled. The work of this nature will be covered by the initial rate for earth work, unless stated to the contrary in the agreement.

1.1.2.1 Trees of girth over 30 cm, measured at a height of 1m above ground level, shall be considered as large trees. Cutting down of large trees shall be paid extra at the rate specified in the Schedule of Rates. The rate shall include lopping of branches, trimming, removal from and clearing of site when stumps are grubbed up in addition. Large trees shall not be cut without specific orders from the Engineer. As few trees shall be cut as is absolutely necessary for the execution of work. The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below subgrade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipe lines, cable, etc. adjacent to the area which are not required to

be disturbed during site clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

1.1.2.2 Any trees cut down or building materials released from dismantling of structures shall be stacked by the contractor within a distance of 100 metres outside the periphery of the area under site clearance as per instructions of the Engineer. The contractor shall have no claim to the trees or other material removed during site clearance and the same shall be the property of the Railway.

1.1.3 **DATA AND SETTING OUT:**

(a) **Initial Data**

At the commencement of work, the Engineer In charge shall give to the contractor the following data/ guidance.

(i) Concrete centre line pillars fixed on the alignment at intervals of 250m

(ii) Pucca level bench marks fixed along the alignment, about 30 m away from the centre line at intervals of 500m. These bench marks shall have been connected by levelling to available GTS bench marks and the reduced level of each shall be communicated.

(iii) Longitudinal section of the proposed formation to scale 1:2500 horizontal and 1:500 vertical with the existing ground level and the proposed formation level marked at intervals of 50m along the alignment and with the location of each curve, bridge, culvert, and level crossing on the entire alignment indicated.

(iv) Existing ground level would be jointly recorded by the Engineer-in-Charge or his representative and the contractor or his representative by taking cross section at an interval of 25m or as suitable so as to produce the general existing ground profile. The Contractor will have to sign the level book as a token of acceptance of the level and it will form the original record for payment.

(v) Ground levels recorded as above would be plotted to a natural scale 1:100 at a subsequent date and desired profile of bank/cutting would also be plotted on it. This will also be signed by contractor and would be the basis for the final payment of earth work to be done.

(vi) The contractor shall be responsible for subsequent preservation of all the above-mentioned pillars and drawings and shall pay for the cost of their replacement, if necessary.

(b) **Setting Out:**

Before commencement of earth work, the Contractor shall demarcate with a furrow, at least 20 cm wide and 15 cm deep, at 50 cms from the toes of slopes of banks and outside limits of tops of cuttings on both sides of centre line and the boundaries of the bottom and top of the borrow pits. The "dag belling" is to be maintained and renewed when necessary, throughout the duration of earth work. The cost of this is included in the rate for earth work.

Concrete pillars of 30 cms square at 50 cms away from and on both sides of the toe of the bank / top of cutting at each cross section would be constructed and maintained by the contractor at his own cost as a part of the setting out works. These concrete pillars should be embedded to a depth of 50 cms. No extra payment on this account is permissible. He will also provide and maintain and maintain templates, burjies, reference pillars etc. and shall take all necessary precautions to prevent these being removed, altered or disturbed and will be responsible for the consequence of such removal, alteration or disturbance and for their efficient reinstatement. No extra payment will be made on this account.

(c) **Profiles:**

In accordance with cross sections supplied, the Contractor shall at his own expense provide all stakes, bamboos, strings, pegs and labour for setting out profiles at every 25m or as directed for correct execution of the work. This will include provision of side drains and catch water drains as necessary in cutting and / or as marked in the cross sections supplied to the Contractor. The top of formation shall invariably have cross slopes of 1:30.

1.1.4 **Mechanised construction of Earthwork:** Manual methods of construction cannot achieve the desired quality of earthwork. Therefore, in all projects, it is necessary to deploy mechanised equipments such as earthmovers, dozers, hydraulic excavators, motor graders, scrapers, dumpers, mobile water sprinklers, vibratory rollers, sheep foot rollers etc. so that quality of work meets laid down standards.

1.1.5 **Maintenance:** Banks and cuttings are to be correctly dressed and finished in profile with slopes as specified in each case. Where gullies or water-cuts commence to form on the slopes of embankments or cuttings, the erosion is to be

checked as early as practicable and made good with suitable material well rammed into place. Where a gully or water-cut has not been checked at its commencement, it may be advisable to cut it out or step it before filling it in, and to further protect the place by turfing, pitching or other means as may be ordered by the Engineer. Work, before being finally paid for, is to be checked by the Engineer as having been correctly brought up, or carried down, to the proper level and to be otherwise complete in all respects in accordance with the specifications.

1.1.5.1 As soon as the work has been satisfactorily completed, the Engineer shall issue a certificate of completion in respect of the work as specified in relevant Clause of the General Conditions of Contract. Unless otherwise specified in the Tender conditions, the contractor shall maintain the banks / cuttings, for a period of Twelve months from the date of completion of work as indicated in the certificate of completion. The contractor shall be responsible for the handing over of the banks/cuttings to the Railway in proper condition, and, where necessary, for their restoration to such condition, at the end of the maintenance period. Until then, the contractor is responsible for all losses due to subsidence, wastage or guttering due to rain, wind, wear, wash or from any other cause whatsoever, and he shall have no claim for any extra work or payment on this account.

1.1.6 **Spoil from cutting to bank: -** Up to the initial lead specified in the BOQ item, material from each end of every cutting – subject to its suitability for use in railway embankment- shall be led forward into the adjoining bank as a matter of course, and the rate to be paid for such material shall be the rate for cutting only. The Engineer shall specify in each case from what point in each cutting to what point in the adjoining bank, spoil shall be led out, payment being made only for the excess lead over and above the initial lead included in the rate for cutting. The Engineer can modify these limits at any stage of the work and all such changes shall be binding on the contractor without any claim for any extra payment on this account. Dressing and compaction of the bank will, however, be paid for in addition.

1.1.7 **Classification of soils: -**The classification of soil/rock met with in executing the work, if not made by the Engineer, shall be made by the his representative authorized by him for this purpose subject to the approval and final decision of the Engineer. The rates to be paid to the contractor in his bills shall be based on these classifications.

Earth work shall be classified under the following heads: -

1.1.7.1 **All kinds of Soils:-** Generally any strata such as sand, gravel, loam, clay, mud, black cotton, moorum, shingle, river or nallah bed boulders, soling of roads, paths etc. macadam surface of any description, lime concrete, mud concrete and their mixtures which for excavation yields to the application of picks, shovels, jumpers, scarifiers, ripper and other manual digging implements.

1.1.7.2 **Ordinary Rock:** Generally, any rock which can be excavated by splitting with crowbars or picks and does not require blasting, wedging or similar means for excavation, such as lime stone, sand stone, hard laterite, hard conglomerate and unreinforced cement concrete below ground level. If required light blasting may be resorted to, for loosening the materials but this will not in any way entitle the material to be classified as 'Hard rock'.

1.1.7.3 **Hard Rock (Requiring Blasting)**: - Generally any rock or boulder for the excavation of which blasting is required Such as granite, quartzite, basalt, reinforced cement concrete below ground level and the like.

1.1.7.4 **Hard Rock (Blasting Prohibited):-**Hard rock requiring blasting as described under **sub para 1.1.7.3**, but where blasting is prohibited for any reason and excavation has to be carried out by chiselling, wedging or any other agreed method.

1.1.8 **Measurements: -**Cutting and banks are to be excavated and made up neatly to the lines shown in the cross section as per approved construction drawing. No payment will be made for excess work done outside these lines except when such work is so ordered in writing by the Engineer. However, in case of embankments, extra width constructed, as per Para 1.2.5.6, to ensure proper rolling and compaction which is subsequently cut and dressed to avoid loose earth on the slopes shall not be paid for.

1.1.8.1 Should the Engineer so desire, he may, at any stage of the work, order the Contractor to increase or reduce the slopes of any cutting or bank or alter the formation level, in which case the amount of work actually done will be paid for in accordance with the specifications and the Schedule of Rates.

1.1.8.2 Unless otherwise specified the rate for Earth work is inclusive of an initial lead and lift as specified in the BOQ.

1.1.8.3 Additional lead for the purpose of payment will be measured from the centre of gravity of excavation to the centre of gravity of the bank or spoil heap, and shall

be measured along the shortest practicable route and not necessarily the route actually taken.

1.1.8.4 Where initial lift is specified**,** additional lift for the purpose of payment will be estimated by dividing the cross section of the bank or cutting into successive stages of 1.5m high or deep respectively from the natural ground level and only the quantity contained in each strip shall be paid for at the rate appertaining to its height or depth above or below the natural ground level, respectively. Lift from the borrow-pit to the ground level or from ground level to the spoil bank shall not be taken into account in any payment for lift unless the depth of the borrow- pit or the height of the spoil bank has been made in excess of 1.5m under instructions from the Engineer, and in such cases, only the portion of the borrow-pit below 1.5m depth or of the spoil bank above 1.5m height as measured from the natural ground level, shall be, measured separately for payment of lift on the same basis as for cuttings or banks respectively.

1.1.8.5 For the purpose of above para, the natural ground level shall be reckoned as that obtaining at the toe of the bank nearest to borrow pits or at toe of spoil bank nearest to the cutting as the case may be. No payment shall be made for any lift from the ground level at the borrow pit to that at the bank, or from the ground level at the cutting to that at the spoil bank, where such lift is inherent in the lead on account of natural ground slope and no obvious act of lifting is involved, in the opinion of the Engineer. Obvious lifts such as involved in crossing of existing pits or banks, which cannot be avoided, will be measured and taken into account for payment. In such cases, the additional lift thus measured shall be taken into account in fixing the successive stage of 1.5m, whether in the bank or in the cutting. In sidelong ground where borrow-pits or spoil banks, as the case may be, are made on both sides, any payment for lift shall be a matter of special agreement.

1.1.8.6 For purpose of payment, cuttings shall be assumed to be composed of such soil /rock only, as stand exposed on both or one side of the finished cuttings, depending upon whether the cutting is box type or one sided on a transversely sloping ground. The content of each type of soil/rock thus assigned to any cross section shall be determined as indicated below. It is to be noted that no portion of cutting will be payable for any such type of soil/rock as is not exhibited on the finished side slope, where the side slope exists.

(a) **For box type cutting**: - The centre line of the alignment will be marked vertically on the cross section and the content of each type of soil/rock will be determined by computing the area of the strip, formed by joining the points, which form the extremity of occurrence of the particular soil

on the finished side slope of cutting, by straight horizontal lines terminating on the centre line. **Figure No.1.1** is illustrative of the manner in which payment is to be made.

(b) **For one sided cutting on a transversely sloping ground:-** Content of each type of soil/rock will be determined by computing the area of the strip, formed by joining the points, which form the extremity of occurrence of the particular soil on the finished side slope of the cutting, by straight lines to the zero point. **FigureNo.1.2** is illustrative of the manner in which the payment for the cutting will be made.

(c) **For widening of existing cuttings for one or more lines where the existing cutting slope disappears and a fresh slope stands:-** Before undertaking widening of the cutting, pre-classification of the existing cutting slope (which will disappear) should be done after clearing and cleaning the surface and the strata met marked on the cross-section sheets. After completion of the work various strata as stand exposed on the new finished slope of the cutting shall again be marked on the cross-sections. Then the demarcation points of adjacent strata as determined by classification of the existing slope and the final slope should be joined as shown in **Figure No.1.3.**

The cross-sectional areas for different strata may be worked out and quantities payable classification-wise assessed accordingly.

(d) **For extension to the existing cutting where no fresh cutting slope is available after work: -**Before execution of the work pre-classification of the existing cutting slope which will not be finally available, should be done and recorded in the initial cross-section. **Figure No.1.4** is illustrative of the manner in which the payment for the cutting is to be made for soil of different classifications.

1.1.8.7 Classification in the above manner shall be made only at such points where the cross sections giving the ground profile have been recorded. The classification as recorded in the above manner in case of cuttings shall be signed by the contractor in token of his acceptance. The classification as recorded by the Authorized representative of the Engineer in the above cases for cuttings is subject to confirmation by the Engineer, whose decision shall be final and binding on the contractor. Where there is disagreement between the Contractor and the Authorized representative of the Engineer on classification of soil, payment shall be affected "on account" as per lower classification as made by the Authorised representative of the Engineer. Payment for extra at the rate for higher

classification shall be made after final decision by the Engineer on the admissibility of the Contractor's claim for higher classification.

1.1.8.8 In computing the quantity of earth work in cuttings and side drains, no cognizance will be taken of the additional excavation, which may be necessitated during the progress of the work due to the presence of boulders or other material, and payment will only be made for the quantity as per cross sections required to be provided.

1.1.8.9 Where cutting spoil is utilised for making the bank, stones over 75mm size, which are not to be used in the bank, shall be stacked separately at a site to be indicated by the Engineer. To determine the quantity of cutting spoil led out for making the bank, the sectional quantity of the cutting shall be reduced by the volume of stones and boulders stacked outside, which will be arrived at by deducting 50% for voids from the stack measurements of these stones and boulders. The stacking of these stones and boulders, including initial lead and lift specified in the item, is covered by the initial rate of Earth work.

1.1.8.10 It must be clearly understood that the Contract rates are intended to cover the full cost of finished work as per approved drawings or as directed by the Engineer with nothing extra payable for work carried out in excess of the requirements. Banks and cuttings are to be carefully dressed to formation with such slopes as may be specified in each case. The payment for the quantity of earth work in cutting / bank shall normally be made on cross sectional measurements. The existing ground / bank profile shall be taken and plotted by the Authorised representative of the Engineer in the presence of contractor or his authorized agent before commencement of the work. The profile of the bank or the cutting required to be provided shall also be plotted on the same sheets. The levels and cross sections shall be signed by both the Authorised representative of the Engineer and the contractor / his authorized agent. (The profiles of the bank or cutting as required to be provided are for the guidance of the contractor and not for the purpose of measurements).

The profiles of the finished and plotted bank/ cutting shall like-wise be taken in the presence of the contractor or his authorised agent and super-imposed on the original ground profile. These profiles are to be taken at locations as directed by the Engineer, at least at 25m intervals on straight and every 15m on Curves with radii sharper than 600m and at extra locations in special cases such as irregular or side long ground etc. The gross volume of earth work shall be calculated from the original and finished profile of the bank/ cutting.

As it may, at times, be difficult to measure by means of cross sections the quantity of rock excavated by blasting or chiselling, owing to its irregular configuration or intermixture with other materials, the quantity of rock may be measured after stacking the excavated rock spoil. The same procedure also applies to any other type of soil/rock, which requires to be measured separately from the material constituting the bulk of the spoil. In all such cases, the payable quantity of the stacked material is to be arrived at by making suitable deductions for voids from the measured cubical contents of the stacks as specified below:

	Type of soil stacked	Deduction
(a)	Rock spoil of different sizes	30 per cent
(b)	Sandy materials	7 ½ per cent
(c)	Black cotton soil	20 per cent
(d)	Other soils, including coal ashes	15 per cent

To facilitate measurement, all stacks to be measured shall be made rectangular in plan and of uniform height, on level ground or ground levelled for this purpose. The stacking of spoil shall be done in a compact manner to the satisfaction of the Engineer. The rates provided shall include all charges on account of such stacking as well as any lead or lift, as also the re-stacking of stacks or portions of stacks which the Engineer considers, in his sole discretion, as not properly stacked.

Where earthwork is required to be done from borrowpits for repairs to bank to make up cess, to fill raincuts etc, the payment for such earthwork will be affected on borrow pit measurements.

As far as possible spoils from cuttings fit for embankment shall be used to make up the bank. If, however, this is found to be uneconomical due to excessive lead or lift, or if sufficient quantity of good earth fit for embankment is not available from the source of cut spoils contractor’s earth approved by Engineer or earth from borrow pits in railway land as directed by Engineer shall be utilised. As far as possible each stretch of bank should be made of earth from only one source so as to avoid mix up. If however, this is not possible due to exigencies of work, earth from one source should be utilised first and compaction done before earth from the next source is allowed to be dumped. Initial cross section of bank and cross section after compaction of earth from each of the sources should be taken. Based on the cross-sectional areas, the gross quantity of earth work in embankment executed by utilising the earth from different sources shall be determined

Final measurements shall be taken only after the bank/ cutting has been completed to the required profile as directed by the Engineer irrespective of the period of completion and number of monsoons that may pass during execution.

1.1.8.11 Where, for any reason at the discretion of the Engineer, borrow-pit measurements are resorted to, all matams and roads and excess earth work, such as bulges in the slopes of the banks, shall be excluded from the measurements.

1.1.8.12 Nothing extra shall be paid for: -

(i) Excavation for insertion of planking and strutting.
(ii) Removing slips or falls in excavations
(iii) Bailing out water in excavations from rains, ordinary springs not requiring pumping etc.
(**Note**: - Pumping out water caused by powerful springs, tidal or river seepage, broken water mains or drains and the like, shall be paid separately if provided for in the Agreement)
(iv) Unauthorised battering or benching of excavations.
(v) Forming steps in sides of deep excavations and their removal after measurements.
(vi) Protective measures for protection against risk of accidents to the public due to open excavation.
(vii) Protective measures / precautions taken to avoid damage to existing Signal / Electrical / Telecom / other Miscellaneous Cables, Pipes, installations etc.

1.1.8.13 **On Account Payment**

1.1.8.13.1 Running on account payments will normally be made only for such length of banks as in the opinion of the Engineer-in-Charge have been finally executed in terms of the conditions of contract. On account payments may however be made at the discretion of the Engineer-in-Charge if uncompleted bank is high or there are other circumstances which may result in heavy investment on the part of the contractor, before he is able to complete a stretch of bank in all respect. Such on-account payment will be made to the extent of only 90% of the total quantity of earthwork. Contractor shall submit **royalty clearance certificate along with Running Account bill**, if the agency fails to submit the royalty clearance certificate, the required amount will be deducted as per extant Govt. rule, from his bill and will be deposited with the concerned dept.

1.1.9 **Dressing Surface: -**

1.1.9.1 This specification is applicable to Surface dressing executed as a separate work for purposes other than earthwork for embankment or cutting. In case of earthwork for embankment or cutting, provisions of **Para 1.1.2** will apply and the surface dressing will be covered by the initial rate of earthwork unless stated to the contrary in the Agreement. This specification shall also be applicable only to earthwork involving soil.

1.1.9.2 The terms "Dressing Surface" shall be taken to mean the cutting down of high portion of a specified area of ground and using the excavated earth to fill up the hollows and the depressions. The maximum depth of excavation or filling shall be restricted to 15 cms.

1.1.9.3 The levels to which the ground is to be dressed shall be such that the quantity filled is nearly equal to the quantity cut and the finished surface is even and tidy with such slopes as may be necessary for proper drainage. Before the work is commenced the proposed levels shall be set up at regular intervals both for the cuts and for the fills, by suitable means as directed by the Engineer and these shall be got checked and approved by him.

1.1.9.4 Unless otherwise provided for in the Contract, the rates shall be inclusive of removal of rubbish upto a distance of 50m outside the periphery of the area cleared.

1.2 EARTHWORK IN EMBANKMENTS

1.2.1 **Profiles: -**Profiles for banks shall be set out where every cross section has been taken. These profiles shall be set up atleast every 25m on the straight and every 15m on curves with radii shorter than 600m. Profiles shall also be set up at any additional places if ordered by the Engineer.

1.2.2 **Formation Width**: - The formation widths are to be as shown in the drawings.

1.2.3 **Side Slopes**: - The side slopes will ordinarily be as shown in the drawing, but the Engineer or his Authorised representative may, by order in writing, vary this slope to suit local conditions.

1.2.4 **Selection of Earth: -**Fill material proposed to be used, either from railway land or from outside shall be assessed for its suitability at contractor's expense, in accordance with RDSO Guidelines. The contractor shall get the prior approval of the Engineer for the quality of the fill material. Soil groups falling under the

classifications GB, GW, GC, GM, GP, SB, SW and SC under IS Code 1498 are generally considered suitable.

1.2.5 **Execution of Earthwork**

1.2.5.1 The spreading of material in layers of desired thickness over the entire width of embankment should be done by mechanical means and finished by a motor grader. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the slope and grade.

1.2.5.2 Thickness of layer is to be decided in accordance with RDSO Guidelines. However, as a good practice thickness of layer should be generally kept as 300mm for fill material and 250mm for blanket material in loose state before compaction.

1.2.5.3 Efforts, in accordance with RDSO Guidelines, should be made to keep moisture content level of the soil in the range of OMC $\pm$ 2% at the time of compaction.

1.2.5.4 The rate of progress should be, as far as possible, uniform so that the work is completed to final level almost at the same time.

1.2.5.5 The rolling for compaction of fill material should commence from edges towards center with minimum overlap of 200mm between each run of the roller. In final pass, roller should simply move over the surface without vibration so that top surface is properly finished.

1.2.5.6 Extra bank width of 500mm on either side shall be rolled to ensure proper compaction at the edges. The extra soil would be cut and dressed to avoid any loose earth at the slopes. This should preferably be done with help of grade cutter. In case of widening of embankments the extra width to be rolled shall be 300mm instead of 500mm.

1.2.5.7 At the end of the working day, fill material should not be left un-compacted. Care should be taken during rolling to avoid ponding on formation.

1.2.5.8 During construction of formation, there may be rainfall to the extent that rain cuts may develop on the surface of formation due to erosion of soil. Care should be taken that these rain cuts are not allowed to develop wide and deep otherwise these locations will remain weak spots.

1.2.5.9 Top of the formation should be finished to cross slope as provided in contract drawings.

1.2.5.10 Once the top surface of the formation has been finished to proper slope and level, movement of material vehicle for transportation of ballast, sleepers etc. should be avoided since these movements will cause development of unevenness, ruts on the surface which will accumulate water and weaken the formation.

1.2.5.11 At locations where the water table is high and the fill soil is fine-grained, it may be desirable to provide a granular layer of about 30 cm thickness at the base, above subsoil across the full width of formation. This work will be carried out if directed by the Engineer for which extra rate will be paid.

1.2.5.12 At places where embankment material are not conducive to plant growth, top soil obtained from site clearance as well as top layer of borrowpits which is rich in organic content and suitable for plant growth, may be stored for covering slopes of embankment and cuttings after construction or other disturbed areas, where revegetation is required as far as practicable.

1.2.5.13 In conversion / doubling / rehabilitation projects, suitable benching of existing slope, in steps 30cm in height and 60cm deep, shall be cut in the existing bank before any new earth is placed, to form a bond between the new and old earth work. It should be ensured that there is no humus material left on the benched slope. Care needs to be taken to avoid entry of rainwater into the formation from this weak junction, otherwise this would result in development of weak formation, slope failure, maintenance problem due to uneven settlement etc.

1.2.5.14 Similar benching is to be provided in side-long ground of which the slope at right angles to the alignment of the banks is 3 Horizontal to 1 vertical or steeper or if ordered by the Engineer. The benching in side long ground will not be separately measured or paid for, but is deemed to be covered by the initial rate for earth work.

1.2.6 **Embankment in Water-logged ground etc.:-** When embankments are to be carried across water-logged or swampy ground or to be made in soil which requires special protective measures, it rests with the Contractor in all such cases to bring these facts to the notice of the Engineer concerned who will direct on the methods to be adopted and the rates to be paid, and will arrange for a special agreement for the same if necessary.

1.2.7 **Borrow Pits: -**The Engineer concerned will direct from where material is to be obtained. As far as possible, Bank should be made of homogeneous material with no mix of rubble or boulders with soil. In case of land provided by the Employer, no excavation for borrow pits shall be made within 2m of the limits of the

acquired land. Borrow pits shall not be dug close to level crossings, bridges or culverts, telegraph poles, electric poles, or close to inhabited areas, unless they can be properly drained to prevent water stagnating. Borrow pits within station limits shall be avoided as far as possible. The earth is to be excavated and thrown to such width, depth and height and in such places as may be from time to time decided.

1.2.7.1 During excavation, the contractor shall take particular care to avoid damage to drains, water mains, cables or other underground work. Should any damage be caused, the Engineer shall be notified immediately and the damage shall be made good at the contractor's expense.

1.2.7.2 Where Earthwork is to be carried out within Railway land and where borrowing of Earth from Railway land is agreed to by the Railway as confirmed in writing by the Engineer-in-charge, Borrow pits shall be excavated within the limits of railway land as directed by the Engineer. The pits must be rectangular or conform to the land boundaries. The sides of the pits next to the toe of the bank are to be sloped down at 2:1, and elsewhere at a slope of 1:1 unless otherwise directed by the Engineer. Any pits wrongly excavated shall be refilled by the contractor at his own cost, and in such a manner as the Engineer directs.

1.2.7.3 Borrow pits are not to be made of uneven depth but the whole area of each pit is to be neatly excavated to the same level. The outer or the most distant half of the borrowpits is to be excavated first, so that in the event of the pits being flooded by rain, there will still be ground available for work.

1.2.7.4 A berm 15m wide is to be left untouched initially at every 80m between edges of borrowpits, and is not to be encroached upon for any excavation except under the instructions of the Engineer. If it is necessary for drainage purposes to cut through the berm, the channel will be made on the side remote from the Bank.

1.2.7.5 In side long ground, the borrow pits are to be dug on the upper side of the bank, and are to be continuous to serve as catch water drains; and, if so ordered, the contractor shall get the earth for the bank exclusively from such pits till the catch water drain is complete to the required length, section and level as prescribed by the Engineer.

1.2.7.6 When doing repair work to banks it is absolutely essential that diagonal bunds be kept, when digging fresh borrow-pits in the old ones, as a precautionary measure for correct assessment of the work. Diagonal bunds are also to be kept in borrow-pits for new works where payments are to be made on borrow-pit measurements. When doing earthwork repairs, Authorised representative of the Engineer should

bear this point in mind and refuse to measure up any pit in which a diagonal bund has not been kept. For repair works it would save a large amount of unnecessary detailed measurements if all pits were excavated to a uniform size as far as practicable.

1.2.8 **Stream diversions**:- When it has been decided to divert a stream adjoining the bank, the excavation for this work is to be undertaken and completed before any borrow pit work is done at site and all earth from such diversion is to be put into the main bank, if so ordered. If earth excavated from the drain is led into the bank, payment will only be made for the quantity excavated including lead and lift if any and not for both cut and fill. In excavating for diversion of stream, care must be exercised by the Engineer that such diversion does not start a land slip.

1.2.9 **Bank executed manually:** -All railway embankments shall be constructed only by mechanical means in accordance with RDSO Guidelines. Other embankments, when executed manually, shall be made in successive layers, of not more than 30cm un-compacted depth, over the whole width. The subsequent layer shall be started only when the previous layer has been completed for a length not less than 30m along the embankment. All large clods shall be broken up in the borrow pits or bank by labour specially detailed for this work. This shall be strictly ensured.

1.2.10 **Backing to bridges**: - In carrying embankments over a bridge or a culvert intended to be covered by the work, the earth work shall be brought up evenly on both sides of the structure so that the pressure may be equalised. In filling in the approaches of a bridge, or the spandrels between small arches, the earth filling shall be raised simultaneously with the wing walls in the former case and with the face walls in the latter, in order that the filling may be well trodden down under the feet of the labourers; and in filling in foundations and backing to revetments, the earth work shall similarly be brought up level as the masonry proceeds. Filling for the backing of bridges or culverts will conform to specifications under **Para 1.6.3** or as ordered by the Engineer.

1.2.11 **Dressing:** -After completion of earth work the slopes shall be neatly dressed to the correct profiles, and shall be made up where required during the maintenance period. The top should be neatly dressed off sloping at an inclination of 1 in 30 either side from the centre line unless otherwise specified in the drawings.

1.2.12 **Turfing**: -Turfing of banks shall be done during the monsoon season, preferably after a heavy shower, when it can be ensured that the bank slopes will remain wet for a long time after planting the grass. Turfing shall be paid for separately. Turfing shall not be commenced without the prior written permission of the Engineer.

1.2.12.1 Before turfing is commenced, the side slopes are to be dressed to the specified section. This dressing is included in the initial rate for earth work, and should a contractor stop work before dressing the bank, he shall be debited with the estimated cost of the dressing to be done by another contractor or departmental labour, as decided by the Engineer. Where the slope is already consolidated, it should be loosened for a depth of about 4 cms before the sods are laid.

1.2.12.2 Turfing shall consist of sods, not less than 10 cm thick and 20 cm square well beaten into the bank till they get a proper hold and form a level and compact mat. The contractor shall be responsible for watering where necessary to ensure that the turf grows properly; and in the event of it not doing so, he will returf such parts as have not grown, at his own cost. The turfing shall be measured and taken over only after the grass has rooted well and has formed a sufficiently dense growth over the earth slopes.

1.2.12.3 Turfing of side slopes of cuttings if ordered by the Engineer shall be carried out in a manner similar to Turfing of bank.

1.2.13 **Sarkanda or similar type of planting on bank slopes: -**Where Sarkanda is planted on bank slopes, the minimum distance centre to centre in rows shall be 75 cm in either direction. The plantation in adjacent rows will be staggered for proper coverage of the area. For other types of plantation, the local practice shall be followed as directed by the Engineer. Where directed to be done, this item will be paid for extra.

1.2.14 **Erosion Control of Slopes on Banks by use of Geo-jute**

Where stipulated, particularly in areas having high erosion problems, the slope may be protected by use of Geo-jute, an eco-friendly, bio degradable material made of jute yarn with a coarse open mesh structure. On degradation it helps in growth of vegetation. The Type of Geo-jute to be used 1, 2 or 3 will be as stipulated. The work of laying and maintaining Geo-jute should be carried out strictly in accordance with the provisions in RDSO's guidelines for Application of Jute Geo-textiles in Railway embankments and hill slopes issued under RDSO/2007/GE:G-008 read with all upto date amendments / revisions.

1.3 EARTH WORK IN CUTTINGS

1.3.1 **Formation width: -**The formation widths, exclusive of side drains, are to be as shown in the drawings. The top width of each side drain will ordinarily be 120 cm at formation level and depth 30 cm, unless shown otherwise in the drawing.

1.3.2 **Side Slopes:** The side slopes will ordinarily be 1:1, unless otherwise shown in the drawing or ordered by the Engineer.

1.3.3 **Excavation:**

1.3.3.1 When so ordered, the centre portion of gullet of the cutting shall be first taken out to the full width of formation to enable the Engineer to determine the slopes suitable to the full length of the particular cutting or to different lengths of it. When the gullet is cut out to its full depth in shallow cuttings, or to the depth of the first cut in deep cuttings, the side portions or triangular sections up to the slopes may be excavated. In deep cuttings, the, second cut will not be started until the top portion is thus completed.

The necessity of excavating cuttings in this manner is evident as, in the event of heavy rain occurring with work partly completed, and the bottom of the excavation uneven and incapable of drainage, excessive delay might occur or excessive pumping might become necessary. The contractor is solely responsible for any such contingency and the railway will not be liable for any compensation.

1.3.3.2 All cuttings shall be taken down carefully to the precise level and section as delineated in the drawings or as ordered by the Engineer. In case the bottom of the cutting is taken down deeper than is necessary by over sight or neglect of the contractor, the hollow must be filled up to true depth with selected material and rammed, at his expense. Cuttings with the formation in rock will be excavated to 15 cm below the true formation and filled up to true level with cutting spoil to ensure that no lumps of solid rock project above formation level. The bottom sloping from centre towards side drains shall be as given in Sub **Para 1.3.3.3** below. Payment will, however be made for earth work in cutting up to the true formation level only.

1.3.3.3 In soft soil the excavation of cuttings shall, in the first instances be carried to about15 cm short of the full depth, so much being left for dressing the bottom true to the formation. The side slopes shall be dressed true and straight and the bottom shall then be completed by sloping if from the centre line towards the side drains to a slope of 1 in 24 or any other slope as shown in the drawing.

1.3.4 **Drainage of Cuttings**:

1.3.4.1 In excavating cuttings, special precautions are to be taken to ensure that the excavations drain themselves automatically. To ensure this, the central block of earth or gullet is to be excavated first. This will be done in such a manner that the bottom of the excavation shall, where possible, slope downwards from the centre

of the cutting towards the ends. It will be made in such cuts or steps as may from time to time, be directed. Generally, in deep cuttings the first cut or step will approximately follow the surface of the ground, where this will secure the necessary slope for drainage, and will be excavated to such depth not exceeding 3m as may be ordered, with perpendicular sides leaving pathways for workmen along the sides of the cut parallel to the central line about every 15 m. In shallow cuttings, not exceeding 2m in the deepest part, the gullet may be cut out at once to formation level.

1.3.4.2 Side drains shall be provided, according to the cross section shown in the drawing at the toe of the slope in all cuttings to ensure proper drainage. Excavation to the required cross section and longitudinal slope to form the side drain will be paid for at the same rates as the cutting.

1.3.5 **Catch-Water Drains**: - Where required, catch water drains cut to the section and profile prescribed, shall be constructed on the uphill side leaving a berm of one metre from the boundary of the railway land and shall be paid for at the same rates as for cutting. The cross-sectional area of the catch water drain shall normally not exceed 0.75 sqm. The spoil from the catch water drain will be deposited to make a uniform slope from the edge of the cutting towards the drain. The material derived from the catch water drain will be used to the extent required to provide the slope and the surplus earth should be deposited in the spoil bank of the cuttings. Unless ordered to the contrary by the Engineer, the Catch water drain must be excavated before the cutting is started.

1.3.6 **Berms and Spoil** B**anks**: - No spoil shall be deposited within a distance of 9m from the top edge of the slope of any cutting duly taking into account the location of the catch water drain, if any. While doing so, the Engineer may bear in mind the side on which the doubling may eventually be done.

1.3.6.1 The spoil heap shall be roughly but neatly dressed off to a slope of 1 ½ : 1, and shall form a continuous bund along the top of the cutting. In country where there is any cross fall, sufficient spoil shall be thrown on the uphill side of the cutting to supplement the catch water drain and assist in keeping drainage out. This work must be done first.

1.3.6.2 (a) All material excavated from cuttings suitable for pitching, ballast, masonry or any other purpose whatever, shall be the property of the Railway, and shall be stacked, as also disposed off, as directed by the Engineer, within the limits of lead specified for stacking of spoil. This is included in the rate for cutting.

(b) Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of value shall be delivered to the Engineer and shall be the property of the Railways.

1.3.7 **Springs or Inflow**: Should springs or inflow of water appear in cuttings, or should they be flooded, the contractor must arrange for bailing, pumping or drainage of water, without obstruction to adjacent works. Payment for the same shall not be made unless otherwise provided for in the Agreement with the Contractor.

1.3.8 **Protections:** Excavation, where directed by the Engineer, shall be securely fenced and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red lights during the night, to avoid accidents. The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes & chambers, communication cables, power supply cables etc. met within the course of excavation shall be properly supported and adequately protected, so that these services remain functional. No extra payment will be made for taking such measures unless otherwise specifically provided for in the Contract. Excavation shall not be carried out below the foundation level of adjacent buildings until underpinning, shoring etc. is done as per the directions of the Engineer for which payment shall be made separately.

1.3.9 **Blasting**: If any blasting operations are necessary, they shall be carried out in accordance with the Explosives Act and the Rules as amended upto date. Explosives Rules 1983 should be strictly adhered to by the Contractor's staff as well as Railway employees engaged in blasting operations. For general guidance, the instructions contained in Chapter X of Indian Railways Works Manual may be referred to. The following specifications are supplementary to the above.

1.3.9.1 Where hard rock is met with and blasting operations are considered necessary, the contractor shall obtain the approval of the Engineer in writing for resorting to blasting operation.

Note: In ordinary rock, not requiring blasting, blasting operations shall not be generally adopted. However, the contractor may resort to blasting with the permission of the Engineer, but nothing extra shall be paid for such blasting operations.

The contractor shall obtain licence from the competent authority for undertaking blasting work as well as for containing and storing the explosive as per the

Explosive Act, 1884 as amended upto date and the Explosive Rules, 1983. The contractor shall purchase the explosives fuses, detonators etc. only from a licenced dealer. Transportation and storage of explosive at site shall conform to the aforesaid Explosive Act and Explosive Rules. The contractor shall be responsible for the safe custody and proper accounting of the explosive materials. Fuses and detonators shall be stored separately and away from the explosives. The Engineer or his authorised representative shall have the right to check the contractor's store and account of explosives. The contractor shall provide necessary facilities for this.

The contractor shall be responsible for any damage arising out of accident to workmen public or property due to storage, transportation and use of explosive during blasting operation.

1.3.9.2 Blasting operations shall be carried out under the supervision of a responsible authorized agent of the contractor (referred subsequently as agent on duty), during specified hours as approved in writing by the Engineer. The agent shall be a licensed blaster. In case of blasting with dynamite or any other high explosive, the position of all the bore holes to be drilled shall be marked in circles with white paint. These shall be inspected by the Contractor's agent. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the agent shall inspect the holes to ensure that drilling has been done only at the marked locations and no extra hole has been drilled. The agent shall then prepare the necessary charge separately for each bore hole. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Only cylindrical wooden tamping rods shall be used for tamping. Metal rods or rods having pointed ends shall never be used for tamping. One cartridge shall be placed in the bore hole and gently pressed but not rammed down. Other cartridges shall then be added as may be required to make up the necessary charge for the bore hole. The top most cartridge shall be connected to the detonator which shall in turn be connected to the safety fuses of required length. All fuses shall be cut to the length required before being inserted into the holes. Joints in fuses shall be avoided. Where joints are unavoidable, a semi-circular nitch shall be cut in one piece of fuse about 2 cm deep from the end and the end of another piece inserted into the nitch. The two pieces shall then be wrapped together with string. All joints exposed to dampness shall be wrapped with rubber tape.

The maximum of eight bore holes shall be loaded and fired at one occasion. The charges shall be fired successively and not simultaneously. Immediately before firing, warning shall be given and the agent shall see that all persons have retired to a place of safety. The safety fuses of the charged holes shall be ignited in the presence of the agent, who shall see that all the fuses are properly ignited.

Careful count shall be kept by the agent and others of each blast as it explodes. In case all the charged bore holes have exploded, the agent shall inspect the site soon after the blast but in case of misfire, the agent shall inspect the site after half an hour and mark red crosses (X) over the holes which have not exploded. During this interval of half an hour, nobody shall approach the misfired holes. No driller shall work near such bore until either of the following operations have been done by the agent for the misfired boreholes.

(a) The contractor's agent shall very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper and withdraw the fuse, primer and detonator.

(b) The holes shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15cm away and parallel to it. This hole shall be charged and fired. The misfired holes shall also explode along with the new one.

Before leaving the site of work, the agent of one shift shall inform another agent relieving him for the next shift, of any case of misfire and each such location shall be jointly inspected and the action to be taken in the matter shall be explained to the relieving agent.

The Engineer shall also be informed by the agent of all cases of misfires, their causes and steps taken in that connection.

1.3.9.3 **General Precautions**: -For the safety of persons red flags shall be prominently displayed around the area where blasting operations are to be carried out. All the workers at site, except those who actually ignite the fuse, shall withdraw to a safe distance of atleast 150 metres from the blasting site. Audio warning by blowing whistle shall be given before igniting the fuse.

Blasting work shall be done under careful supervision of licensed blaster and trained personnel shall be employed. Blasting shall not be done within 100 metres of an existing structure, unless specifically permitted by the Engineer in writing. In such cases, the Authorised representative of the Engineer must be present to ensure that special precautions as may be prescribed by the Engineer and those stipulated by the licensing authority are taken and that necessary warning is given to the inhabitants.

All procedures and safety precautions for the use of explosives drilling and loading of explosives before and after shot firing and disposal of explosives shall

be taken by the contractor as detailed in IS 4081, Safety code for blasting and related drilling operation.

1.3.9.4 **Precautions against Misfire**: -The safety fuse shall be cut in an oblique direction with a knife. All saw dust shall be cleared from inside of the detonator. This can be done by blowing down the detonator and tapping the open end. No tools shall be inserted into the detonator for this purpose.

If there is water present or if the bore hole is damp, the junction of the fuse and detonator shall be made water tight by means of tough grease or any other suitable material.

The detonator shall be inserted into the cartridge so that about one-third of the copper tube is left exposed outside the explosive. The safety fuse just above the detonator shall be securely tied in position in the cartridge. Water proof fuse only shall be used in the damp bore hole or when water is present in the bore hole.

If a misfire has been found to be due to defective fuse, detonator or dynamite, the entire consignment from which the fuse, detonator or dynamite was taken shall be got inspected by the Engineer or his authorised representative before resuming the blasting or returning the consignment.

1.4 **EARTH WORK BY DEPARTMENTAL MATERIAL TRAINS - Deleted**

1.5 **EXCAVATION OF FOUNDATIONS FOR BUILDINGS / TRENCHES FOR PIPELINES ETC. - Deleted**

1.6 **EARTH FILLING IN FOUNDATION TRENCHES AND PLINTH, UNDER FLOORS AND BEHIND ABUTMENTS ETC. - Deleted**

1.7 **SHORING OR TIMBERING FOR TRENCHES – Deleted**

1.8 **PUDDLE – Deleted**

1.9 **MECHANICAL COMPACTION OF EARTHWORK**

Note: Based on RDSO's "Guidelines for Earthwork in Railway Projects" (July 2003 – Guideline No.GE: G-1 to which reference may be made for further details.)

1.9.1 **Orders for Compaction:-** Depending upon the height of the embankment the type of the soil, time available for completing the embankment, the importance of

the line and other relevant factors such as axle load, permitting higher speeds within a limited time etc, the Engineer shall decide whether Mechanical compaction is to be done for the full or part height of the embankment.

1.9.2 **Advantages of Compaction: -**

1.9.2.1 Compaction is the process of increasing the density of soil by mechanical means by packing the soil particles closer together with reduction of air voids and to obtain a homogeneous soil mass having improved soil properties. Compaction brings many desirable changes in the soil properties as follows:

(a) Helps soils to acquire increase in strength in both bearing resistance 6and shear strength.
(b) Reduces compressibility, thus minimising uneven settlement during services.
(c) Increased density and reduces permeability, thereby reducing susceptibility to change in moisture content.
(d) Reduction in erodibility
(e) Results in homogeneous uniform soil mass of known properties.
(f) Reduction in frost susceptibility in cold regions.

1.9.3 **Factors affecting Compaction in the field: -**

Compaction of a particular soil is affected by moisture content, compacting effort, type of roller etc. as explained below:

(a) **Compacting Effort**: In modern construction projects, heavy compaction machinery is deployed to provide compaction energy. Types of machinery required are decided based on type of soil to be compacted. The method of compaction is primarily of four types viz kneading compaction, static compaction, dynamic or impact compaction and vibratory compaction. Different type of action is effective in different type of soils such as for cohesive soils, Sheeps foot rollers or pneumatic rollers provide the kneading action. Silty soil can be effectively compacted by Sheeps-foot roller / pneumatic roller or smooth wheel roller. For compacting sandy and gravelly soil, vibratory rollers are most effective. If granular soil has some fines both smooth wheeled and pneumatic rollers can be used.

(b) **Moisture Control:** Proper control of moisture content in soil is necessary for achieving desired density. Maximum density with minimum compacting effort can be achieved by compaction of soil near its OMC (Optimum Moisture Content). If natural moisture content of the soil is

less than the OMC, calculated amount of water should be added with sprinkler attached to water tanker and mixed with soil by motor grader for uniform moisture content. When soil is too wet it is required to be dried by aeration to reach upto OMC.

(c) **Soil Type:** Type of soil has a great influence on its compaction characteristics. Normally, heavy clays, clays and silts offer higher resistance to compaction, whereas, sandy soils and coarse grained or gravelly soils are amenable for easy compaction. Coarse-grained soils yield higher densities in comparison to clay. A well-graded soil can be compacted to higher density.

(d) **Thickness of Layer:** Suitable thickness of soil of each layer is necessary to achieve uniform compaction. Layer thickness depends upon type of soil involved and type of roller, its weight and contact pressure of its drums. Normally, 200-300mm layer thickness is optimum in the field for achieving homogeneous compaction.

(e) **Number of Passes:** Density of soil will increase with the number of passes of roller but after optimum number of passes, further increase in density is insignificant for additional number of passes. For determination of optimum number of passes for given type or roller and optimum thickness of layer at a predetermined moisture content, a field trial for compaction is necessary which will be arranged by the Engineer for which the Contractor shall make all arrangements and bear the cost of test / tests as required.

1.9.4 Compaction Procedure for Different Soils

The embankments are constructed with locally available soil provided it fulfils the specified requirements. Procedure of compaction to be adopted will depend on the type of soil being used in construction. General guidelines to deal with compaction of various types of soils for attaining optimum dry density/ relative density at minimum effort, have been briefly given as under. The procedure to be adopted will be decided by the Engineer for strict adherence by the Contractor.

1.9.4.1 Compaction of Cohesion-less Gravely and Sandy Soil

(i) Sandy & gravely soils should be compacted with vibratory rollers. If fines are less in these types of soils, it can be compacted with minimum number of passes of vibratory rollers without strict control of moisture to achieve desired Relative Density. With higher percentage of fines, sandy and

gravely soils need to be brought to OMC level to get effective compaction. Uniformly graded sand and gravel are difficult to be compacted. Top layer of sand and gravel remains loose in vibrating compaction. Therefore, in final pass the roller should move smoothly without vibration. Dry densities attained in field trials normally should be around MDD/ specified Relative Density as obtained from laboratory tests and should form the basis for specification and quality control.

(ii) Poorly graded sand and gravel with Cu<2.0, should not be used in earthwork for the banks to safeguard against liquefaction under moving loads or especially due to earthquake tremor. Generally, fine sand is prone to liquefaction. This aspect should be specifically examined to prevent possibility of any liquefaction.

1.9.4.2 **Compaction of Silty- Clayey Soils**

Silty soil is a fine-grained soil. These can be plastic or non-plastic depending upon the clay content in it. Silts and fine sands with high water content have a tendency to undergo liquefaction under vibrating rolling due to the pore water pressure generated by mechanical work. Silty soils can be compacted satisfactorily near about OMC either with smooth rollers or vibratory rollers. Vibratory roller will give high degree of compaction and higher lift. Compaction of silty clays will have to be handled in a manner similar to clays.

1.9.4.3 **Compaction of Clays**

(i) Water content plays very important role in compaction of clays. Main objective of compacting predominantly clays is to achieve uniform mass of soil with no voids between the lumps of clays. If moisture content is too high, roller tends to sink into the soil and if too low the chunks would not yield to rolling by rollers. Appropriate water content i.e. OMC of the soil is in the range of about plastic limit plus, two percent. Sheeps- foot rollers are most effective in breaking the clods and filling large spaces.

(ii) Thickness of layer should not be more than depth of feet of roller plus 50mm. Pad foot vibratory roller with drum module weight of 7 tonne (total static weight of 11 tons) for a lift thickness of 30 cm is found quite effective for compaction of clays. For better results, initial rolling with static pad foot roller followed by 15 tons vibratory roller can be tried.

(iii) In case of such soils, the MDD and OMC as determined in the Laboratory may not be very relevant and therefore achievable MDD and practicable

moisture content at which such soils can be compacted should be determined by conducting field trials for which the Contractor shall make all arrangements and bear the cost of field trials as required.

1.9.5 **Selection of Compacting Equipment:**

The performance of roller is dependent mainly on type of soil used in construction. Guidelines on selection of compacting equipment are given in **Annexure 1.2.** Vibratory rollers which can be used in static as well as dynamic mode with plain and pad drum, are now being manufactured by reputed Indian Companies also. Salient features of some of models are given in **Annexure 1.3**. The Contractor should get the Engineer's approval for the type of equipment to be deployed for compaction.

1.9.6 **General Aspects of Mechanical Compaction**

(a) The spreading of material in layers of desired thickness over the entire width of embankment should be done by mechanical means and finished by a motor grader. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the slope and grade.

(b) Thickness of layer is decided based on field compaction trials. However, as a good practice thickness of layer should be generally kept as 300mm for fill material and 250mm for blanket material in loose state before compaction.

(c) If natural moisture content (NMC) of the soil is less than the OMC, calculated amount of water based on the difference between OMC and NMC and quantity of earthwork being done at a time, should be added with sprinkler attached to water tanker and mixed with soil by motor grader or by other means for obtaining uniform moisture content. When soil is too wet, it is required to be dried by aeration to reduce moisture content near to OMC. Efforts should be made to keep moisture content level of the soil in the range of OMC $\pm$ 2% at the time of compaction.

(d) Fill shall be placed and compacted in layers of specified thickness. The rate of progress should be, as far as possible, uniform so that the work is completed to final level almost at the same time.

(e) The rolling for compaction of fill material should commence from edges towards center with minimum overlap of 200mm between each run of the

roller. In final pass, roller should simply move over the surface without vibration so that top surface is properly finished.

(f) Extra bank width of 500mm on either side shall be rolled to ensure proper compaction at the edges. The extra soil would be cut and dressed to avoid any loose earth at the slopes. This should preferably be done with help of grade cutter.

(g) At the end of the working day, fill material should not be left un-compacted. Care should be taken during rolling to provide suitable slope on toe of the bank to facilitate quick shedding of water and avoid ponding on formation.

(h) During construction of formation, there may be rainfall to the extent that rain cuts may develop on the surface of formation due to erosion of soil. Care should be taken that these rain cuts are not allowed to develop wide and deep otherwise these locations will remain weak spots.

(i) Top of the formation should be finished to cross slope of 1 in 30 from one end to other towards cess / drain in multiple lines and from center of formation to both sides in single line.

(j) Once the top surface of the formation has been finished to proper slope and level, movement of material vehicle for transportation of ballast, sleepers etc. should be avoided since these movements will cause development of unevenness, ruts on the surface which will accumulate water and weaken the formation.

(k) In conversion / doubling / rehabilitation projects, suitable benching of existing slope shall be done as provided for in the contract before new earthwork is taken up to provide proper bonding between old and new earthworks. It should be ensured that there is no humus material left on the benched slope. Care needs to be taken to avoid entry of rainwater into the formation from this weak junction, otherwise this would result in development of weak formation, slope failure, maintenance problem due to uneven settlement etc.

(l) At locations where the water table is high and the fill soil is fine-grained, it may be desirable to provide a granular layer of about 30 cm thickness at the base, above subsoil across the full width of formation. This work will be carried out if directed by the Engineer for which extra rate will be paid.

1.9.7 **Quality Control of Compacted Earth / Blanket layer**

1.9.7.1 **Compacted Earth**: Degree of compaction of each layer of compacted soil should be ascertained by measurement of dry density / Relative Density of soil at locations selected in specified pattern. The method of sampling, frequency of tests, method of tests to be conducted and acceptance criteria to be adopted are as under.

(a) **Method of Sampling:**

(i) Various methods of selection of sample points for check of in-situ dry density are in vogue. The sampling adopted has to be such that effectiveness of proper compaction having been done for the entire area under consideration can be judged. For this, the Engineer will lay down in detail the method to be adopted in detail depending on site conditions and accordingly records of checks done are to be properly maintained. However, in absence of such procedure laid down, following method should be adopted.

Suggested Method of Sampling: For each layer, a minimum of one sample at a predetermined interval (in compliance with the requirement stated in next para) along the centreline of the alignment, would be taken in a staggered pattern so as to attain a minimum frequency of tests as given in sub para "b" below. For subsequent layer, the stagger should be such that the point of sampling does not fall vertically on the earlier sampling points of the layer immediately below. Additional sampling points can be taken, as considered necessary.

(ii) In case of bank widening, sampling should be done at an interval of minimum 200 metres on widened side(s) of embankment.

(b) **Frequency of Tests:**

Density check would be done for every layer of compacted fill / blanket material as per following minimum frequency:

(i) At least one density check for every 200 sqm. for blanket layers and top one metre of sub-grade.

(ii) Atleast one density check for every 500 sqm. for other than blanket and one metre of sub-grade.

In case of bridge approaches or special locations closer frequency may be adopted.

(c) **Method of In-situ Dry Density Measurements**

Any of the following methods could be adopted as per the requirements at site. RDSO's guidance may be taken for adoption of other methods such as by use of Nuclear Moisture Density gauge and Compact Meter fitted on rollers.

Method of Measurement	Procedure of test	Parameters to be measured	Remarks
(i) Sand Replacement Method	As per IS-2720 (Part 28) 1974	(a) Insitu Dry Density (b) Moisture content	May be adopted for all type of soils
(ii) Core Cutter Method	As per IS-2720 (Part 29) 1975	-do-	In some of the coarse-grained soils (with little fines) taking core cutter samples is difficult. In such cases, sand replacement method maybe used for density measurement.

Acceptance Criteria:

(i) Coarse grained soils which contains fines passing 75 microns IS Sieve, upto 5 percent should have the Density Index (Relative Density) a minimum of 70% as obtained in accordance with IS:2720 (Part-14)-1983.

(ii) For other soils, field dry density should not be less than maximum attainable dry density obtained in field compaction trial. However, in field compaction trial, the maximum attainable dry density should not be less than 98% of MDD values as obtained by Heavy Compaction Test (IS 2720 (part 8) – 1983) in the laboratory.

In case, there are difficulties in achieving 98% of the MDD values as obtained by Laboratory test, in the field trials, the same may be relaxed upto 95% of MDD with the specific approval of the Engineer, recording reasons of such relaxation.

(iii) During widening of bank in case of gauge conversion and rehabilitation of unstable formation, compaction of earthwork should be minimum 95% of MDD as obtained by Laboratory test as per Heavy Compaction Test (IS:2720 (part 8) – 1983) or 70% Relative Density for cohesion less soil (IS:2720 (Part 14) –1983).

1.9.7.2 **Formation Level:** Finished top of sub-grade level may have variation from design level by ± 25 mm and finished top of blanket layer may also be permitted to have variation from design level by plus 25mm. The ballast should be placed only on level formation without ruts or low pockets.

1.9.7.3 **Cross Slope:** Cross slope should be within 1 in 28 to 1 in 30.

1.9.7.4 **Side Slopes:** Side slope should in no case be steeper than designed side slope. Provision of berm width should not be less than the designed width.

1.9.7.5 **Formation Width**: Formation width should not be less than the specified width.

1.10 **BLANKETING**

Note: Based on RDSO's Specification No. GE.IRS.2 (Final) dated July 2005 on "Mechanically produced Blanketing Material for Railway formation including Guidelines for Laying" to which reference may be made for further details.

1.10.1 **Scope:** Where the drawings provide for a Blanket of coarse and granular material of thickness as shown therein over the full width of formation, the contractor shall arrange for the supply of the materials at site, spreading over the formation earthwork and for consolidation as detailed below. The thickness of blanketing layer shall be fixed in light of the Guidelines dated July 2005 of RDSO referred to in the Note above.

1.10.2 **Sample for Material:** The successful contractor should submit for approval by the Engineer samples of the Blanketing material in three wide mouth sealed glass jars of a quantity of 0.0035 Cum. each. The material to be used by the contractor for blanketing should strictly adhere to the quality of material as approved by the Engineer.

1.10.3 Specifications of Blanket Material

Blanket material produced in a plant should generally conform to following specifications:

(a) It should be coarse, granular and well graded.

(b) Skip graded material is not permitted.

(c) Non -plastic fines (particles of size less than 75 micron) are limited maximum to 12%, whereas plastic fines are limited maximum to 5%.

(d) The blanket material should have particle size distribution curve within one of the bands of enveloping curves shown in **Figure 1.5** or the percent passing of the material through each IS sieves should lie between the upper and lower limit of blanket material as given in the **Table 1.1**

(e) The material should be well graded with C_u& C_c as under: Uniformity Coefficient, $C_u = D_{60}/D_{10} > 7$

Coefficient of curvature, $C_C = \frac{D_{30}^2}{D_{60} \times D_{10}}$ between 1 and 3

(f) Particle size distribution must follow one of the gradation ranges tabulated below.

Table 1.1: Particle size distribution ranges for different grades of blanket material

S. No.	IS Sieve size	Grade A	Grade B	Grade C
1.	40 mm	100	95-100	95-100
2.	20 mm	100	93-100	80-100
3.	10 mm	95-100	85-95	65-85
4.	4.75 mm	92-99	70-92	43-70
5.	2 mm	65-90	46-65	22-46
6.	600 microns	33-50	22-33	08-22
7.	425 microns	28-40	18-28	05-18
8.	212 microns	16-27	10-16	00-10
9.	75 microns	00-12	00-10	00-08

1.10.4 **Selection of Blanket Material**

Depending on the source of material, the blanket material can be categorized in the following categories:

- Natural material
- Machine manufactured material
- Crushed material
- Blended material

1.10.4.1 Proper survey of area close to projects needs to be carried out to identify suitable sources of blanket material required for the project. Aim of such source identification survey is to use naturally available material, or select alternatives of machine manufactured blanket material through crushing, blending or a combination, which is cheap and conforms to the specifications laid down.

1.10.4.2 The parent material of the blanket material so chosen should be chemically inactive and sturdy in normal working environment. Brickbats, factory slag, weak dissolvable stones like lime, shale, laterite etc. need not be selected as blanket material.

1.10.4.3 The choice of gradation as provided in 1.10.3 (f), above, may be exercised judiciously, based on the availability of material. It may be advisable to choose the grade A for finest subgrade soils (requiring 1.0m thick layer of blanket), and grade B or C for coarser subgrades (requiring less thickness of blanket).

1.10.5 **Mechanical Production:**

The Blanket can be produced by adopting either crushing methodology or Blending Methodology as described in Paras 6.1 and 6.2 respectively of RDSO's Specification No.GE.IRS.2 (Final) dated July 2005 and to which reference can be made for any details. Crushing Methodology is resorted to in the event of non-availability of natural source of blanket materials and involves crushing the rock / boulder to produce crushed blanket material. Blending methodology involves proper blending of two or more soils or in combination with soils crushed material like stone chips or quarry dust.

1.10.6 **Quality Control on Blanket Material at Production Site**

1.10.6.1 The source of blanket material, detailed in para 1.10.4, needs to be identified based on tests & studies conducted and conformity of the material to the Specification as laid down in para 1.10.3.

1.10.6.2 It is desirable to have a check on quality of material at source/manufacturing point so that major deviation in quality of the material being sent to site does not exist. It would be in the interest of the supplier to have such tests conducted on his own to avoid any complication at a later stage.

1.10.6.3 The frequency of such test could be laid down by the engineer in-charge, if need be. In the absence of any other instructions, at least one test may be performed per day to check the particle size gradation at the point of loading into the trucks. However, the final acceptance of the blanket material should be at the site where it is laid, as per para 1.10.6.6.

1.10.6.4 The supplier/ Engineer may also lay down proforma for 'Incoming Material Register' to be maintained at manufacturing point for having a control on utilization of different grades of material, especially where blending is done using crushed as well as local material.

1.10.6.5 **Test for Quality:** Blanket material should be tested as per IS: 2720 (Part 4) of a minimum of one test per 500 cum. or part thereof to plot particle size distribution curve, so as to assess its suitability. It would be necessary to carry out wet analysis to assess actual percentage of fines. To expedite testing work, dry sieve analysis may be carried out if variation between results of dry and wet analysis are not significant and adequate margin exists with respect to acceptance criteria. However, in such cases also, wet analysis has to be carried out at frequent interval to verify the extent of variation. In any situation, acceptance of blanket material would be based on wet analysis only. The sample for wet analysis should be prepared as per para 4.3 of IS: 2720 (Part 4).

1.10.6.6 **Acceptance Criteria:**

The material should generally conform to specification as given at para 1.10.3.

1.10.7 **Transportation:**

The blanket material should be transported wet after mixing water in order to achieve OMC, in tippers for direct unloading on formation.

1.10.8 **Laying, Spreading and Compacting**

1.10.8.1 The blanket material must be spread with a tractor mounted grader or a paver-finisher in layers of uniform thickness, before allowing compaction.

The blanketing should generally cover the entire width of formation from shoulder to shoulder. In case of sand or non-cohesive material it should be confined within a trench with berms of 60 to 75 cm width and sand drains across the cess to drain the track and the blanket. The cross drains should be with adequate slope at 5 to 10 cm below the bottom of the blanket and spaced 3 m apart. The thickness of the blanket shall be at least 30 cms but may be increased depending on local conditions.

1.10.8.2 Compaction to specified levels of RD or percentage of MDD (para **1.10.10.3**) will be carried out through a number of passes of vibratory rollers of 100-120 kN static weight or equivalent capacity. A combination of vibrating rolling initially and static finishing rolling may be established through trials. Speed of roller shall not exceed 5 km/hr.

1.10.8.3 Proper control of moisture is required to optimize the compaction effort. Optimum moisture content may be established through Modified Proctor Apparatus (IS: 2720, part 8) and moisture may be added by sprinkling at the plant or at site as per the requirement.

1.10.8.4 Rolling is to be carried out in layers of not more than 300 mm each, following the same camber profile as provided in the subgrade layer and to be maintained upto the top layer.

1.10.8.5 No provision for un-compacted portion may be made on the edges of embankment. The sides may be hand rammed with a suitable rammer.

Note: *The engineer should generally expect to get MDD above 2.1 gm/cc, and OMC in the range of 5-9%, as matter of guidance.*

1.10.9 **Quality Control Checks on Finished blanket work:**

1.10.9.1 Degree of compaction of each layer of compacted blanket should be ascertained by measurement of dry density/Relative Density of soil at locations selected in specified pattern. The method of sampling, frequency of tests, method of tests to be conducted and acceptance criteria to be adopted are as under.

1.10.9.2 **Method of Sampling:**

(a) The sampling adopted has to be such that effectiveness of proper compaction having been done for the entire area under consideration can be judged. For this, the Engineer in-charge should lay down the method adopted in detail depending on site conditions and accordingly records of

checks done are properly maintained. However, in absence of such procedure laid down, following method should be adopted:

(b) **Suggested Method of Sampling:** For each layer, a minimum of one sample at a predetermined interval (in compliance with the requirement stated in next para) along the centreline of the alignment would be taken. The checking points may be staggered to the extent possible.

(c) **Frequency of Tests:** Density check would be done for every layer of blanket material as per following minimum frequency:

At least one density check for every 200 sqm of blanket layer. (say, every 18 to 30 m for single line, or doubling work and every 12 to 16 m for a double line construction.)

1.10.9.3 **Method of in-situ dry density measurements:**

Any of the following methods could be adopted as per the requirements at site.

Method of measurement	Procedure of test	Parameters to be measured	Remarks
(i) Sand Replacement Method	As per IS-2720 (Part 28) 1974	(a) Insitu Dry Density (b) Moisture content	May be adopted for all type of material
(ii) Core Cutter Method	As per IS-2720 (Part 29) 1975	-do-	In some of the coarse-grained soils (with little fines) taking core cutter samples are difficult. In such cases, sand replacement method may be used for density measurement.
(iii) Nuclear Moisture Density Gauge	As issued by RDSO	(a) Bulk density (b) Moisture content (c) Dry density (d) Degree of Compaction	May be used in consultation with RDSO
(iv) Compactor meters fitted on roller (On roller continuous compaction control)	As issued by RDSO	As issued by RDSO	May be used in consultation with RDSO.

1.10.10 **Acceptance Criteria**

1.10.10.1 The material should pass the criteria laid under Para 1.10.6.6 above.

1.10.10.2 The blanket material, which contains fines passing 75 microns IS Sieve, upto 5percent should have the Density Index (Relative Density) a minimum of 70% as obtained in accordance with IS: 2720 (Part 14) – 1983.

1.10.10.3 For other materials, field dry density should not be less than maximum attainable dry density obtained in field compaction trial. However, in field compaction trial, the maximum attainable dry density should not be less than 98% of MDD values as obtained by Heavy Compaction Test (IS: 2720 (part 8) – 1983) in the laboratory. In case, there are difficulties in achieving 98% of the MDD values as obtained by Laboratory test, in the field trials, the same may be relaxed upto 95% of MDD with the specific approval of Chief Engineer/construction, recording reasons of such relaxation.

1.10.10.4 During widening of bank in case of gauge conversion and rehabilitation of unstable formation, compaction of blanket layer should be minimum 95% of MDD as obtained by Laboratory test as per Heavy Compaction Test (IS: 2720 (part 8) – 1983) or 70% Relative Density for cohesion less soil (IS: 2720 (Part 14) – 1983).

1.10.11 **Measurement**

1.10.11.1 Measurement of blanket material should be done on the basis of finished cross section after the material and workmanship have been accepted as per the above criteria. No deduction is to be made towards voids.

1.10.11.2 In very rare cases, where it is not possible to take blanket material on finished subgrade, measurement may be done on the basis of stack measurement with the permission of Chief Engineer in-charge. It may be necessary to frame different schedule items for different methods of measurement. There should be no occasion to change the method of measurement unless specifically provided for in the tender documents duly approved by competent authority.

1.10.11.3 Method of measurement in case of stack measurement may be the same as in case of ballast incorporated in "Specification for track ballast-1999".

1.10.11.4 It is advisable to tally the quantity and quality measured at site with the 'Incoming Materials Register' maintained at plant (para 1.10.6.4) as a means of double check.

Figure Nos.1.1 to 1.4

SKETCHES SHOWING MANNER OF COMPUTATION OF QUANTITIES OF VARIOUS CLASSIFICATIONS OF SOIL
(FIG. Nos. 1.1 to 1.4)

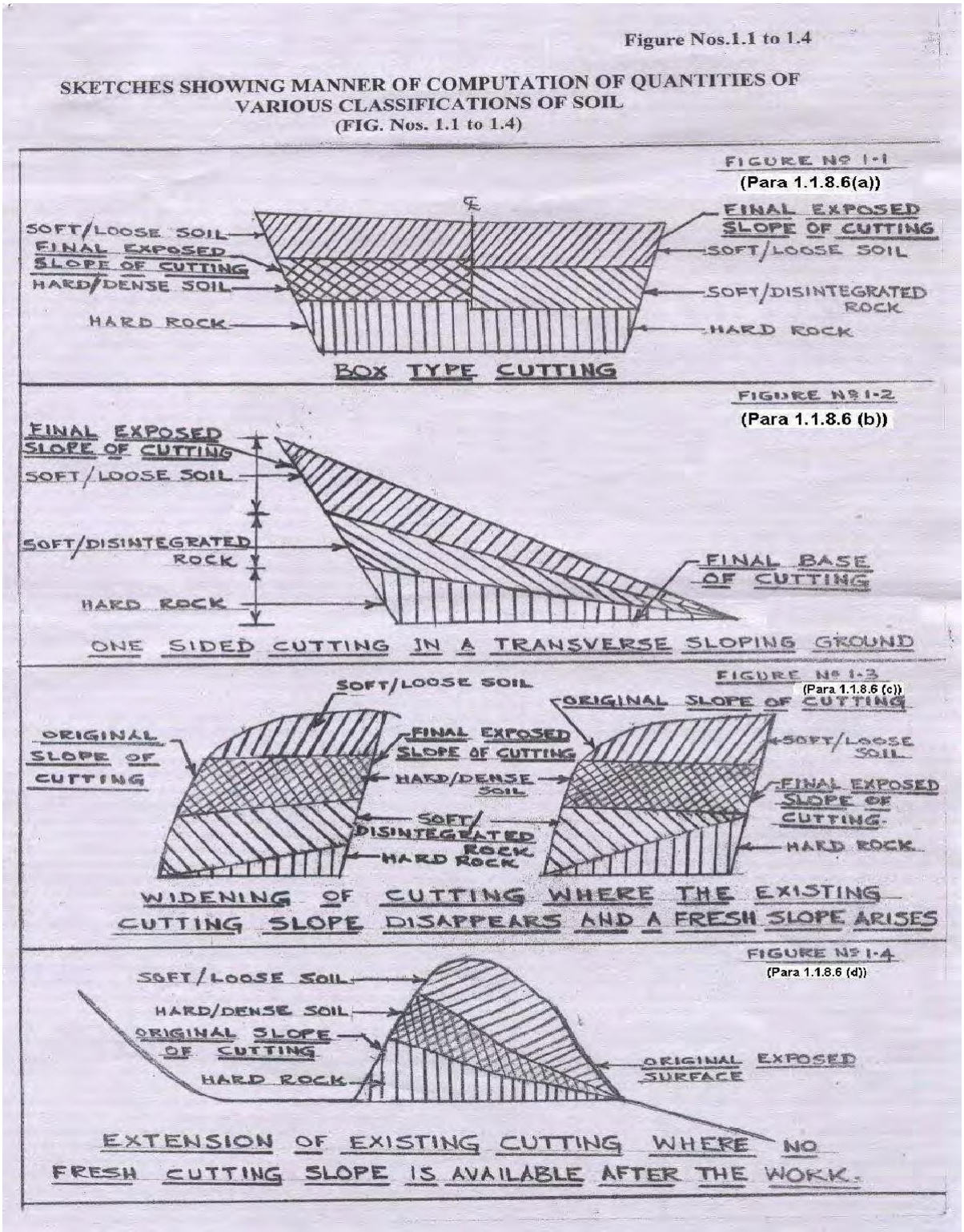
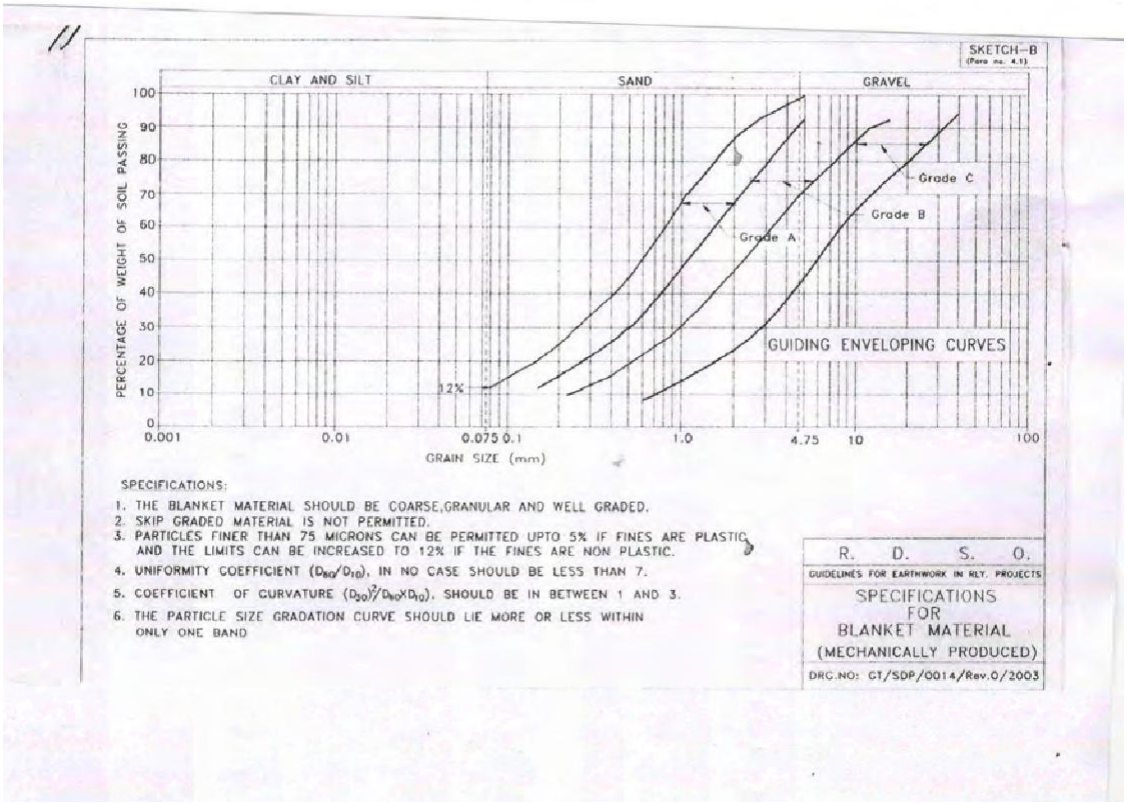


Figure 1.5

Graph showing the different enveloping curves for different grades of blanket material



TECHNICAL SPECIFICATIONS
FOR BRIDGE WORKS AND ROAD WORKS

TECHNICAL SPECIFICATIONS FOR BRIDGE WORKS AND ROAD WORKS

1.0 GENERAL

1.1 General Requirement

The contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings and as described herein.

1.2 Reference Points and Bench Marks

Permanent reference pillars established and fixed in the area shall not be removed or disturbed under any circumstances without the approval of the Engineer. The Engineer-in-Charge will locate initially the centre line of the bridges and set out the centre point. Contractor will provide all labour and materials required for this purpose. The contractor shall set out details of position/profile of individual foundations, piers, abutments etc. and be responsible for accuracy thereof. The contractor shall carefully maintain and protect all benchmarks and reference points and shall lay out all his work by accurate reference there to. The relevant level of structure at different part will be checked by Engineer-in-charge or his representative.

2.0 EXCAVATION

2.1 Site Clearance

The contractor shall remove all vegetation, trees, structures and any foreign material existing at the site of proposed work. The area shall be stripped to remove roots of grass/trees, and other organic materials which shall be burnt and/or removed to approved disposal areas or other locations as indicated by the Engineer-in-Charge. Cost of labour, tools, transport etc. required for this is deemed to be included in the overall rate.

2.2 General Requirements

The contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the approved drawings and as described herein.

2.3 Drainage in the Vicinity of Excavations

The contractor shall control the surface grade in the vicinity of all excavations so that the surface of the ground in vicinity is properly sloped or diked to prevent surface water from running into the excavated areas during the progress of the construction.

2.4 Excavations shall include the removal of all materials as per direction of the Engineer-in-Charge, as may be required to execute the work properly. Excavation shall be made with sufficient clearance to permit the placing, inspection and setting of forms and completion of all works for which the excavation is made.

2.5 Sides and bottoms of excavation shall be cut sharp and true. Undercutting shall not be permitted. Earth sides of excavation shall not be used in lieu of formwork for placement of concrete unless otherwise authorised in special cases, by the Engineer-in-Charge where limitations of space for larger excavation necessitate such a decision

2.6 When machines are used for excavation, the last 300 mm before reaching the required level shall be excavated by hand or by such equipment that will leave the soil at the required final level, in its natural condition.

2.7 The Bearing capacity of the soil at the bottom of excavation shall be determined by the Engineer-in-Charge, so as to decide on the depth of foundation.

2.8 The bottom of excavation shall be trimmed to the required levels and when carried below such levels by error shall be brought to level by filling with concrete 1:3:6 or as specified, at the contractor's cost.

2.9 If the contractor is directed by the Engineer-in-Charge to excavate to a lower level than that indicated on the drawings and covered by through rates, such additional excavation shall be paid for at the applicable unit rate.

2.10 The contractor shall be responsible for assumptions and conditions regarding the nature of materials to be excavated and the difficulty of making and maintaining the required excavations and performing the work required as shown on the drawing and in accordance with these specifications. Coffer-dams, sheeting, shoring, bracing, draining, dewatering, etc. shall be arranged and installed as required and the cost thereof shall be included in the unit rate quoted for the item of excavation. The contractor shall be held responsible for any damage to any part of the work and property caused by collapse of sides of excavations. Material used for temporary works may be salvaged if it can be done without jeopardising safety of the work and structures and subject to approval of the Engineer-in-

Charge. However, no extra claim shall be entertained for material not salvaged or any other damage to contractor's property as a result of the collapse. He shall not be entitled to any claim for additional payment for having to re-do the excavation as a result of the same.

2.11 All excavation for installation of underground facilities, such as piping, sewing, sewer lines, tunnels, ducts, drain lines etc. shall be open cuts.

2.12 Where excavation requires bracing, sheeting, or shoring etc. the contractor shall submit to the Engineer-in-Charge, drawings showing arrangements and details of proposed installations and shall not proceed until he has received approval from the Engineer-in-Charge.

2.13 For purposes of excavation of earthwork, the following definitions shall apply, when a through rate is not specified.

(a) **Ordinary Soil**

All kinds of soil except soil containing 50% or more of kankar, moorum and/or shingle and rock.

(b) **Hard Soil**

Soil containing 50% or more of kankar, moorum and/or shingle and boulders upto 150 mm size, without binding material, shall be classified as hard soil, but the decision of the Engineer-in-Charge in the matter of classification of the soil shall be final and binding on the contractor.

2.14 **Measurement**

Measurement for payment will be based on volume calculations determined by the existing grade, (ground level) and the bottom elevation (level) of structure/lean concrete with lateral dimensions (vertical sides) 0.3 m outside concrete outline of lowest footing for depths upto 1 m below existing grade and 1 m outside concrete outline of lowest footing for depths more than 1 m below existing grade (ground level). (Concrete dimensions determined from drawings). The unit of measurement shall be cubic metre. Nothing extra would be payable for slope, shoring, strutting etc. irrespective of the fact that they are actually provided. Payment includes leading excavated soil to a spoil dump or for reuse in a location in the vicinity as directed by Engineer-in-Charge.

2.15 **Excavation in Rock-Hard, Soft or Decomposed**

2.15.1 For the purpose of classification of rock in excavation, the following definitions shall apply:

(a) **Hard rock requiring blasting**

Any rock excavation for which blasting is required.

(b) **Soft or Decomposed rock**

Lime stone, sand stone, laterite, hard conglomerate or other soft or disintegrated rock which can be quarried or split with crow bars or wedges.

2.15.2 **Excavation**

The specifications for excavation the Clause No.2.0 to 2.13 above shall apply to excavation work in rock also, except for the bottom of excavation, where depending on the type of rock, over-breaks upto a maximum depth of 0.3 m below the required level may be allowed by the Engineer-in-Charge at his discretion and paid accordingly. Concrete backfill in such over-breaks shall also be paid for. No payment shall, however, be allowed for backfilling, if such overbreak's are required to be brought to grade by filling with only soil including its proper compaction.

2.15.3 Blasting material required for excavation work included in this tender shall be arranged by the contractor at his cost, from any authorised dealer of such approved material. Necessary assistance for obtaining approval for procurement of the material will be given by the NHIDCL/Employer. The contractor shall be fully responsible for entering into agreement with any authorised magazine contractor in respect of rates, regularity of supply etc. Contractor will also obtain necessary license for transporting, stocking and use of explosives and draft only suitable qualified and licensed personnel for handling the explosives.

2.15.4 **Blasting**

All rules under the Explosives Act or other local rules in force shall be fully observed. All blasting works shall be done in accordance with the stipulations contained in the Indian Standard Specification No. IS: 4081. Blasting shall be done by employing qualified personnel and under careful supervision. Blasting shall only be carried out at certain specified times as directed by the Engineer-in-Charge. Proper precautions for safety of persons and property shall be taken. Where blasting is to be carried out in the proximity of other structures, sand bags etc. shall be used on top of the blast holes to prevent the rock fragments, from causing damage to adjacent structures and other property. The unit rate for excavation involving blasting shall be inclusive of the cost of providing all necessary materials, labour and arranging for such precautions.

2.15.5 **Unexploded Charge**

The number of blasts to be fired and the actual number of shots heard shall be compared and the person responsible shall satisfy himself by site examination that all blasts have exploded before any person working in the area is permitted to re-approach the work site. The withdrawal of the unexploded charge shall not be permitted under any circumstances. The unexploded charge shall be flooded with water and the hole marked in a distinguishable manner. Another hole shall be made at a distance of about 450 mm off the old hole and fired in the usual way. This process shall be continued till the original blast is exploded.

2.15.6 **Decomposed or Soft rock**

Excavation in "decomposed or soft rock" shall be carried out by blasting, by crow bars, by shovel and pick axes etc. or by both the methods. No extra shall be paid for the use of any particular method.

2.15.7 **Chiselling in Hard Rock:**

Where blasting is prohibited or not practicable, excavation shall be carried out by chiselling and payment shall be made at the same rate as provided for hard rock requiring blasting. The decision of the Engineer-in-Charge in this regard shall be final.

2.15.8 All excavated materials obtained from excavation shall remain client's property. The useful portion shall be separated from the useless ones and deposited in regular stacks at places indicated and as directed by the Engineer- in-Charge.

2.16 **Measurement**

(i) As soon as level of rock is reached, the contractor shall intimate the Engineer-in-Charge, who shall record the level for calculating quantities of excavation in rock.

(ii) When "hard rock" and "decomposed or soft rock" are mixed together, the entire quantity of excavation done below rock level shall be recorded from cross-section taken before commencement and after completion of rock excavation, payment lines being as provided in clauses 2.14 and 2.15.2. The hard rock excavated shall be stacked, measured and reduced by 30% to allow for bulking and voids to arrive at the quantity payable under "hard rock". The difference between the entire excavation below

rock level (between the pay lines) and the quantity payable under "hard rock" shall be paid for as "decomposed or soft rock".

(iii) In case, the quantity of "hard rock" alone as measured above is in excess of the theoretical total payable quantity of excavation below rock level, then payment under "hard rock" shall be restricted to the total theoretical payable quantity.

(iv) All excavated material, rock or soil, obtained as a result of over-excavation and for which payment shall not be made, shall also be carried and disposed of as directed and stacked at places shown by the Engineer-in-Charge, at the cost of the contractor.

(v) In the case of stray boulders which are classified as "hard rock", measurements of such outcrops shall be made on the basis of linear measurements of the outcrop made before excavation. Such measurements shall be signed by the contractor as token of acceptance before excavation is taken in hand.

(vi) When the excavation in rock is paid for as a single item for all classes of rock, the measurement will be made based on cross-sectional area after recording rock level at commencement and finishing.

2.17 Excavation below Water Table

2.17.1 Wherever water table is met with during the excavation the Contractor shall immediately report the fact to the Engineer-in-Charge who shall arrange to record the exact level of the water table. The decision of the Engineer-in-Charge in the matter shall be final.

2.17.2 The Contractor shall dewater and maintain the water table below the bottom of the excavation level during excavation. concreting and back-filling.

2.18 Methods of Measurements

In the case of excavation in rock, payment for overbreaks upto a maximum depth of 0.3 m below the required level may be allowed by the Engineer-in-Charge at his discretion. No extra is payable for dewatering operation during execution of work.

3.0 RUBBLE BACKING

3.1 A backing of dry rubble walling will be provided behind abutments and wing walls for facilitating proper drainage. It shall be provided to dimensions in accordance with the drawings.

3.2 The materials used should be broken stone of quality approved by Engineer-in-Charge. The stones used will be of least dimension of 15 cm in any direction and not friable. Materials selected from out of excavated material may be permitted to be used by Engineer-in-Charge, in which case only labour rate is payable for the work. Otherwise, the cost will include supply of all materials, labour and tools.

4.0 **BACKFILL**

4.1 The contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings and as described herein.

4.2 After completion of foundation footings, abutments and wing walls and other constructions below the elevation of the final grades and prior to backfilling, all forms, temporary shoring, timber etc. shall be removed and the Excavation cleaned of all trash, debris, and perishable materials. Backfilling shall begin only with the approval of the Engineer-in-Charge.

4.3 Backfilling shall be done with inorganic materials, obtained from the excavation or borrow pits, if suitable, and subject to the approval of the Engineer-in-Charge. Filling behind abutments and wing walls shall be done with sandy materials to be obtained from approved source.

4.4 Backfill shall not be dropped directly upon or against any structure in locations where there is danger of displacement or damage.

4.5 Backfill shall be placed in horizontal layers not exceeding 20cmin thickness. Each layer shall be compacted under proper moisture content and with such equipment as may be required to obtain a density equal to or greater than 94% of maximum as determined by the relevant Indian Standards. Trucks or heavy equipment for depositing or compacting backfill shall not be used within1.5 m of building walls, piers, or other facilities which may be damaged by their weight or operation. The methods of compaction shall be subject to the approval of the Engineer-in-Charge. Pushing of earth for backfilling shall not be adopted under any circumstances.

4.6 Backfill adjacent to pipes shall be hand placed, free of stones, concrete, etc. compacted uniformly on both sides of the pipe and where practicable, to a depth

of 300 mm over the top of pipes. While tamping around piping, care shall be taken to avoid unequal pressures.

4.7 On completion of structures, the earth surrounding them shall be accurately finished to line and grade as shown on the drawings. Finished surface shall be free of irregularities and depressions and shall be within 50 mm of the specified level.

4.8 **Measurements**

Measurements shall be based on the volume by computed cross-sections.

5.0 **CONCRETE**

5.1 **Scope**

5.1.1 This section of the Specification covers the technical requirements for furnishing, forming, placing and finishing all concrete, plain and reinforced complete for all structures at all elevations, superstructures, tunnels, ducts and trenches and including encasement of steel section as shown on the drawings except as otherwise specified, and providing necessary recesses, weep holes etc.

5.1.2 All concrete works as indicated in the scope of this contract shall be carried out as per these specifications.

5.2 **General Requirements**

5.2.1 The contractor shall furnish all labour, material and equipment to form, place and finish all structural concrete and miscellaneous items complete, as indicated on the drawings and as described herein.

5.2.2 All materials, tests, mixing, placing, formwork, reinforcing and workmanship shall conform to the Indian Railway Standard Code of Practice for Plain and Reinforced Concrete for General Bridge Construction (Revised latest edition) (Concrete Bridge Code) and subsequent amendments and other relevant codes of the Bureau of Indian Standards and/or as shown on drawings and/or described herein, or quoted in the Concrete Bridge Code.

5.3 **Materials**

5.3.1 Cement shall conform to IRS Concrete Bridge Code of Year 1997 (incorporating A&C Slip No. 11, Year 2007) clause 4.1.

5.3.2 Concrete aggregates shall conform to “Specification for Coarse and Fine Aggregate from Natural Sources for Concrete" IS: 383 (Latest Edition).

5.3.3 Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkali’s, organic materials, or other deleterious substances.

5.3.4 Reinforcement shall be Thermo Mechanically Treated (TMT) High Yield Strength Deformed (HYSD) bars of grade Fe 500 conforming to IS: 1786 (latest edition) from primary manufacturer. All reinforcement shall be clean and free from loose, mild scales, dust, loose rust and coats of paint, oil or other coatings, which may destroy or reduce bond.

5.3.5 Reinforcement accessories shall be furnished by the contractor. Binding wire shall be annealed from wire quality not less than No. 16 S.W. gauge (1.65 mm dia). Bar supports, chairs and bolsters (as approved by the Engineer-in-Charge) shall be sufficiently strong to support the steel properly

5.4 Concrete Mix

The compression strength as measured by works test at 28 days, shall be as indicated on the drawings for the different areas and types of construction or as indicated in IRS-Concrete Bridge Code 1997.

5.4.1 Where controlled concrete is used, the minimum cement content will be as per IRS Concrete Bridge Code 1997.

5.4.2 Concrete grade upto M-20 will be Nominal Mix Concrete with proportions of materials as per Clause-9.3 and Table-9 of I.S. 456: 2000. Concrete grade above M-20 will be as per mix design to be submitted by the contractor from the Govt. recognised laboratory as per direction of Engineer-in-charge conforming to Code IS-10262:1982(SP-23:1982, P-122). Trial mix will be carried out jointly by the Contractor and the Site Engineer of NHIDCL and cement consumption thereon will be decided on the basis of Trial mix (minimum cement content 400 Kg/cum for RCC and 350 Kg/cum for PCC or as per trail mix whichever is higher). No extra payment will be made for this mix design or trial mix of any grade.

5.5 Sampling and Testing in the Field

5.5.1 Samples of concrete shall be taken at the direction of Engineer-in-Charge in the field in accordance with IS: 1199 "Methods of sampling and analysis of concrete".

5.5.2 These samples shall be tested for strength and consistency attesting laboratory set up at the Project site or at any other Government Laboratory, approved by the Engineer-in-Charge, in accordance with IS: 516. The moulds, labour and material for cubes shall be supplied by the contractor who shall also arrange to transport the cubes to laboratory at his cost. Actual cost of the testing shall be borne by the contractor.

5.5.3 The acceptance criteria for concrete shall be as given in subsequent paras. Only the slumps indicated in the approved design mix shall be adopted. However, larger slumps than those indicated in the approved design mix of concrete of a specified grade (strength) may be necessary to get a workable consistency for concrete in the case of beams, walls columns and other heavily reinforced members. No extra payment shall be made for extra cement that may have to be added in such cases to get the concrete of the same specified grade (strength) with larger slumps. The decision of Engineer-in-Charge regarding the degree of consistency or the amount of slump shall be final.

5.5.4 Samples shall be cured under laboratory conditions, except when in the opinion of the Engineer-in-Charge extreme weather condition may prevail at which time the Engineer-in-Charge may require curing under job conditions.

5.5.5 If the 'test strength' of the laboratory-controlled cubes for any portion of the concrete work falls below the compressive strength specified, the Engineer-in-Charge shall have the right to order a change in the proportions or the water content for the remaining portion of the structure.

5.5.6 If the 'test strength' of the job cubes falls below the specified strength, the Engineer-in-Charge shall have the right to require provisions for temperature and moisture control during the period of curing as necessary to secure the required strength, and may require re-tests in accordance with "standard method of securing, preparing and testing specimens for hardened concrete for compressive and flexural strengths".

5.5.7 When the cubes tested reveal a strength lower than those specified, the acceptance criteria for such concrete shall be decided as stipulated in subsequent paras. The Engineer-in-Charge shall also reserve the right to reject whole or any part of the work. In case of acceptance of such works the standard deviations shall be worked out, and examined by the Engineer-in-Charge and if he is

satisfied only then such works can be accepted at the accepted or at the reduced rate.

5.5.8 For the purposes of statistical analysis any cube result, which in the opinion of Engineer-in-Charge is due to improper sampling, moulding or testing shall be discarded and a dummy result shall be substituted. The value of dummy result shall be equivalent to the average value of the cubes from the same grade of concrete tested immediately before and after the discarded value.

5.6 General Storage

5.6.1 All materials shall be stored by the contractor in a manner affording convenient access for identification and inspection at all times. The storage facilities arrangements shall be subject to the approval of the Engineer-in-Charge.

5.6.2 Cement shall be stored by the contractor in silos or suitable weather-proof buildings with dry floors, to be provided by the contractor, in a manner to prevent deterioration.

5.6.3 Aggregate shall be stored by the contractor in areas floored with tightly laid wooden planks or other approved hard, smooth and clean surface, in a manner precluding intrusion of any foreign material. Aggregates of different classes shall be stored in separate piles sufficiently removed from each other to prevent the material at edges of the piles from getting intermixed.

5.6.4 Reinforcement shall be stored off the ground in a manner to prevent objectionable changes in original surface characteristics in separate piles or racks above grade.

5.7 Mixing and Placing Concrete

5.7.1 Concrete shall not be placed in any unit of the work until after the forms, bracing, reinforcing steel and other preparations for casting have been approved by the Engineer-in-Charge and approval given in writing to proceed with the casting. Concreting under severe cold conditions shall not be permitted.

5.7.2 No concrete shall be placed except in the presence of the Engineer-in-Charge or his authorised representative. Concrete which is not placed in accordance with the specifications or which is of inferior quality as determined by the Engineer-in-Charge shall be removed and replaced by the contractor at his cost.

5.7.3 It is imperative that all excavations prepared for concrete construction are maintained free of water until such concrete work is completed. The contractor shall make provisions and furnish equipment as required for such dewatering, subject to approval by the Engineer-in-Charge. Water used for flushing concrete placing equipment shall be discharged clear of the concrete and forms.

5.7.4 All concrete shall be mixed until there is a uniform distribution of materials, and shall be discharged completely before the mixer is recharged. Mixing shall be done in a mechanical mixer and the type and size shall be subject to the approval by the Engineer-in-Charge. The mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued at least two minutes after all materials are in the drum. For batches larger than 0.75 cum, mixing time shall be increased at the rate of 15 seconds for each additional 0.75 cum or fraction thereof. All concrete shall be discharged within 3 minutes after the introduction of mixing water to the cement and aggregates unless a different time is specified by the Engineer-in-Charge.

5.7.5 Before beginning a run of concrete all hardened concrete and foreign materials shall be removed from the inner surfaces of mixing and conveying equipment. The first batch of concrete through a cleaned mixer for use in the works shall contain 15% less coarse aggregates than normal in order to compensate for coating the interior of the mixer. All conveyance buggies and borrows shall be thoroughly cleaned at frequent intervals during the placing of concrete. Concrete shall be rapidly handled from the mixer to the place of final deposit and shall not be delivered by spout or troughs nor dumped into carriers with a free fall from the mixer of more than 1 m. Every possible precaution shall be taken to prevent separation or loss of the ingredients while transporting the concrete.

5.7.6 The placing of concrete shall be a continuous operation with no interruption in excess of 30 minutes between the placing of continuous portions of concrete. Concrete shall be deposited in such a manner as would prevent displacement of forms or reinforcement above the level of the fresh concrete, and the formation of seams or planes of weakness within the sections. Each layer shall be plastic where a new layer is placed upon it. Concrete shall be deposited as close to its final position as practicable in order to prevent segregation. After initial set of concrete the forms shall not be jarred and no strain or vibrating equipment shall be placed on the ends of projecting reinforcement. Chutes used to convey concrete shall be surfaced with metal or other material, and their slopes shall not be such as to cause segregation. Suitable spouts or baffles shall be provided to prevent segregation during discharge. Where concrete is placed manually by use of pans, the entire pan with the concrete shall be dropped to the surface where concrete is to be deposited instead of emptying the pan manually.

5.7.7 Concrete shall not ordinarily be placed underwater. In unavoidable cases, such concreting shall be done only with the specific approval of procedure and application by the Engineer-in-Charge Additional cement shall be added as necessary and shall be paid for only at issue rate.

5.7.8 To secure maximum density and eliminate formation of air pockets the concrete shall be thoroughly vibrated and worked around all reinforcement, embedded facilities and into corners of forms. Unless other methods are authorised by the Engineer-in-Charge, mechanical vibrators shall be used for the purpose, the type and operation of which is subject to the approval of the Engineer-in-Charge. The extent of vibration shall be through the entire depth of each new layer and several inches into the layer below. With vibration applied at the point of deposit and uniformly throughout the freshly placed concrete, not farther apart then the radius over which the vibration shall be sufficient to accomplish thorough compaction and complete embedment of reinforcement. The tendency for large aggregate to gravitate to lower elevations due to vibration shall not relieve the contractor from his responsibility of obtaining a uniform density throughout the mass. Excess cement pastes thus formed at the top of each layer shall be removed before the succeeding layer is deposited. Hand tamping shall not be permitted.

Contractor shall provide proper equipment other similar areas where conventional methods would not be adequate. Immersion type vibrators shall be provided at the rate of at least one 65 mm unit per 4 cum per hour together with at least one stand-by vibrator of the appropriate size. Vibrators shall be inserted in the concrete at a sufficient number of places so that their fields of influence overlap and shall not be used to work the concrete along the forms or screens. Vibrators shall be withdrawn in time to prevent the formation of voids. Over-vibration causing segregation, surface laitance, or leakage through the forms shall be avoided. Where electrically operated vibrators are used, diesel or petrol driven stand-by vibrators shall be available for carrying on uninterrupted vibration in case of power failure.

5.7.9 **The contractor shall establish/arrange for concrete batching plant of** adequate **capacity for speedy execution of the work and shall have adequate number of transit mixture/concrete pump etc. for transportation & placement of concrete. (NOT MANDATORY)**

5.8 Construction Joints

5.8.1 The location and details of construction joints not indicated on the drawings must be approved of by the Engineer-in-Charge before concrete is poured.

5.8.2 Construction joints in foundations shall not be provided without specific concurrence of the Engineer-in-Charge.

5.8.3 When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean with wire brushes etc. thoroughly wetted, and covered with a 10 mm layer of neat cement slurry. This10 mm layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.

5.8.4 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgment of particles of aggregate. The surface shall be thoroughly wetted for 24 hours beforehand and all free water removed. The surface shall then be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm in thickness and shall be well-rammed against old work, particular attention being paid to corners and close spots.

5.8.5 The unit rate of concrete work shall include the cost of preparation of construction joints as mentioned above and no extra payment shall be admissible on this account.

5.9 Inserts

5.9.1 All anchors, anchor bolts, inserts, pipes, conduits, sleeves, brackets, frames, nosings, bolts, etc. and any other items that are required to be embedded in the concrete shall be placed in correct position before pouring. Extra care shall be taken during pouring operation to maintain their location. Blockouts and openings shall be kept as indicated in the drawings. These inserts shall be welded to the nearest reinforcement to keep them in position and all such welding shall be deemed to be included in the unit rate quoted and no extra shall be payable on this account.

5.9.2 Provision will be made for insertion of holding down bolts on piers/bed-blocks in form of necessary holes by leaving a suitable insert before concreting and removing the same after the concrete attains adequate strength. These holes will be filled with cement sand mortar after the girders are aligned and holding down bolt is inserted and fixed in position.

5.10 Curing

5.10.1 Unless otherwise specified, all concrete shall be moist, cured by keeping all exposed surfaces, edges and corners continuously moist for at least seven days after being placed by spraying, ponding or covering with waterproof paper or moisture retaining fabric.

5.10.2 Immediately after stripping of the forms, water shall be applied directly to the concrete surfaces, the wetting down operations shall be continuous within the curing time specified. As an alternative to continual wetting down of pier/abutment/girder faces, the use of a sprayed-on membrane may be substituted subject to approval by the Engineer-in-Charge.

5.11 **Method of Measurement**

Measurement shall be in cubic metres correct upto second place of decimal. Deductions shall be made for all block outs and openings but not for embedment, reinforcements, and weep holes.

6.0 **FORMWORK**

6.1 All details of formwork, placing, tieing etc. shall be subject to the approval of the Engineer-in-Charge and the contractor when required shall submit drawings, showing details of form construction. The contractor shall be responsible for the adequacy of the formwork to withstand the pressure of freshly placed concrete or other loads imposed without failure, movement or deflection of the component parts. Forms shall be true to the shape, lines and dimensions of the concrete work as shown on the drawings.

6.2 For concrete surfaces that are exposed to view and for all other concrete surfaces that are to be finished smooth, the lining of forms shall be of smooth, non-absorbent lining material. The type and conditions of such lining for forms shall be subject to the approval of the Engineer-in-Charge. All edges of panels shall be square and straight in both directions, and all panels shall match perfectly in length, width and alignment as required.

6.3 All forms shall be sufficiently tight to prevent the loss of liquid from the concrete. All rubbish particularly chipping, shaving and saw dust shall be removed from the interior of the forms before the concrete is placed and the formwork in contact with concrete shall be cleaned and thoroughly wetted or treated with an approved composition to prevent absorption of water from adherence of form to the concrete. Such composition shall be kept out of contact with reinforcement and shall be non-staining and non-injurious to concrete.

6.4 Form lumber may be reused, provided it is true unwrapped, thoroughly clean and without broken or damaged edges and equal in every respect to new lumber. All reform lumber shall have the contact surfaces re-oiled or recoated with an approved composition prior to usage.

6.5 Contractor shall keep an accurate record of the date on which the concrete is cast for each part of the work and the date on which the form work is removed.

6.6 Removal of forms from structural concrete shall be in accordance with the following requirements.

6.7 No supporting forms shall be removed suddenly in such a manner as to create shock-loading.

6.8 Form work for sides shall not be removed before 2 days.

6.9 Bottom forms shall not be removed before 28 days unless this period is reduced with specific concurrence of Engineer-in-Charge.

6.10 **Method of Measurement**

Measurement of form work where separately provided for and so included in the Schedule shall be based on contact area of concrete work from dimensions shown on the drawings. The unit of measurement shall be sq. metres correct to second place of decimal. Otherwise, the cost will be part of rate quoted for concrete works.

7.0 BENDING AND PLACING REINFORCEMENT

7.1 Contractor shall as per instruction of Engineer-in-Charge, fabricate and place reinforcement to shapes and dimensions as indicated or required to carry out intent of drawings and specifications.

7.2 The contractor shall prepare bar-bending Schedule on the basis of the drawings marked "released for construction" and submit the same for approval. No work shall be commenced without the approval of the Schedule.

7.3 Any adjustments in reinforcement to suit field conditions and construction joints other than shown on drawings shall be subject to the approval of the Engineer-in-Charge.

7.4 The contractor shall adhere strictly to requirements for concrete cover over steel reinforcement, protection of bars for bonding with future extensions, columns ties, splices, laps, spacer bars, temperature reinforcement, mesh reinforcement and other items in connection with proper placing.

7.5 Reinforcement shall be placed accurately, tied or welded securely at intersections and splices, and held in position with spacers or other approved supports during concrete placement. Tie wire ends shall be pointed away from surface. Where bars at laps are welded, the length of weld shall be minimum 8xd welded on both sides of the joint and shall be in accordance with the relevant Indian Standards. The contractor will not be entitled to any extra payment for welding the reinforcements.

7.6 Payment for steel reinforcement bars shall be on the basis of weight of bare steel irrespective of any coating applied in metric tonnes. The weight of the bar shall be derived from the sizes and corresponding unit weights given in hand book of BIS. Standard hook lengths, chairs, spacer bars and authorised laps only shall be included in the weight calculated. Binding wires shall not be weighed nor otherwise measured. Measurements for weight shall not include cutting allowance etc.

7.7 Bending of bars will normally be done 'cold'. Engineer-in-Charge's specific approval will be obtained for hot-bending of bars. Torsteel/Deformed bars will under no circumstances be hot-bent. No extra will be payable for hot-bending in lieu of cold bending.

8.0 TESTING OF GRADE MIX CONCRETE

For Grades M-20 and above Sampling, Strength Test and Acceptance Criteria shall be as stipulated in Para 8.7 of Concrete Bridge Code-197, extracts at **Annexure A.** Procedure for carrying out Cube Compressive Test is at **Annexure B**.

9.0 PIPE CULVERTS

9.1 General

9.1.1 The pipe used shall be in accordance with IS: 458-56 "Concrete Pipes" and the type will generally be to class NP-4, unless otherwise specified in the drawing. They shall also be provided with collar unless otherwise specified or permitted by the Engineer-in-Charge.

9.1.2 The laying of pipes will be in accordance with IS:783 Code of Practice for laying of concrete pipes and guidelines in Section 2300 of Ministry of Shipping and Transport Specification for Road and Bridge works.

9.2 Materials and Handling

9.2.1 All materials used in the manufacture of pipes as well as laying in the pipe culverts shall conform to the general requirements contained in the IS Specification mentioned above and indicated in the foregoing sections.

9.2.2 Each consignment of the pipes shall be inspected, tested where considered necessary and approved by the Engineer-in-Charge before their incorporation in the works. If the pipes are not being cast in the vicinity of the works, suitable facilities shall be provided for the Engineer-in-Charge to inspect them during the process of manufacture and at the place of manufacture. Necessary test certificates for the material used shall be produced to the Engineer-in-Charge when demanded.

9.3 Excavation

9.3.1 The foundation bed for the pipes shall be excavated true to the levels and grades shown in the drawing or as directed by the Engineer-in-Charge. The pipes shall be placed in shallow excavation made in natural ground, or in trenches cut in the previously made embankments. Where the height of fill exceeds 3 times the external diameter of the pipe before excavating for pipe laying, the embankment shall first be made and properly consolidated upto a level of one pipe diameter above the proposed top of the pipe for length equalto5 pipe diameters on either side of centreline, trenching being done thereafter. The sides of the trench shall be nearly vertical as possible, and the clearance between sides, and pipe shall not be less than 150 mm or more than 1/3rd the pipe diameter.

9.3.2 If soft, spongy or other type of unstable soil is met with during such excavation, the unsuitable material shall be removed to depth, width and length as directed by the Engineer-in-Charge and be back filled with approved granular soil which shall be thoroughly compacted and shaped to the specified level and shape.

9.3.3 Where bed-rock-boulder, hard clay, shale or other hard material is met with, the excavation shall be taken for at least20mm below the bottom level of the pipe and space filled with approved soil, free of stone, fragmented material etc. and compacted for providing adequate support unless concrete bedding is specified otherwise.

9.3.4 Generally pipes for railway culverts will be laid on concrete bedding unless otherwise specified in the drawing.

9.4 Bedding for Pipe

The concrete used for the bedding shall have mix which shall have a 28-day compressive strength of not less than 140 Kg/Sq.cm. Unless otherwise specified bedding shall have a minimum thickness of 1/4th of the normal diameter of the pipe and form a cradle extending for 1/4th of the diameter of the pipe above the lowest bedding level. Suitable recess will be provided in the bedding for resting the projection, collars, etc. for the pipe.

9.5 Back Filling

9.5.1 Trenches shall be back filled soon after the jointing material has hardened. Back filling shall be made of selected good soil free of stones, roots or other organic matter and the soil shall be approved by the Engineer-in-Charge. The back filling shall be done carefully with selected/approved material upto 30 cm above the top of pipe and entirely rammed and consolidated at optimum moisture content. It shall be laid in layers not exceeding 150 mm. Care should be taken particularly while consolidating the soil under the haunches of the pipe. Consolidation below and above haunches of the back fill shall be done by foot, light tampers or hand-operated mechanical equipment approved by Engineer-in-Charge.

9.5.2 Filling shall be done simultaneously on both sides of the pipe so that unequal pressures do not occur. No walking or working out the completed pipe shall be permitted till it is back-filled upto 30 cm over the pipe except for purpose of consolidation of fill.

9.5.3 In case of high embankment after filling the trench upto the top of the pipe, a loose fill of a depth equal to the external diameter of the pipe shall be placed over the pipe before further layers are added and compacted. This shall be done for the full width of the trench. Only further layers placed above this level, shall be compacted.

9.6 Face Walls and Wing Walls

Face walls, wing walls and aprons, etc. shall be constructed in accordance with shall be permitted over the pipe culvert unless the filling over the pipe is at least 60 cm.

9.7 Measurements for Payment

9.7.1 RCC pipe culverts shall be measured along their centre between the inlet and outlet ends in linear meters. Length for supply and laying includes supply of collars jointing material and all labour required for laying, aligning, jointing and curing joints.

9.7.2 Selected granular material and cement concrete for pipe bedding shall be measured as laid in cubic metres. Ancillary work like head walls, etc. shall be measured as provided under the respective sections.

9.8 **Rates**

9.8.1 The rate for the pipe shall include the cost of pipe and matching collars including loading, unloading hauling handling, storing, laying in position and jointing complete.

9.8.2 Ancillary work such as excavation including back filling, concrete and masonry shall be paid for separately, as provided under the respective clauses.

10.0 **PROTECTION WORKS**

10.1 **Pitching**

General

Pitching shall not be laid until the banks on which it is to be laid have become consolidated. Before slope pitching is commenced, unless a floor apron is also provided, a trench is to be dug at the toe of the bank, 50 cm deep, or to the depth shown on the drawings, and 15 cm layer of quarry chips or ballast must be laid in trench, on the bed of the pitching.

All earth surfaces that are to be pitched and subsequently exposed to the action of running water, must be covered with a rammed layer of gravel, moorum or quarry refuse to a depth of about 15 cm or as ordered by the Engineer In charge. This under layer prevents the finer material of the bank of being sucked out by the flowing water.

10.2 **Stone Pitching and Flooring**

The stones for stone pitching shall be set in the work as received from the quarry, and without any dressing except knocking off weak corners and edges with a mason's hammer. A small proportion of chips may be allowed to show in the face

work. The face stones must in general weigh at least 30 Kg and not more than 60 Kg unless otherwise specified, and be well-bedded and hand set in the earth or dry-stone backing, which must be brought up at the same time as the hand set face work. If the backing is of earth, it shall be rammed in 30 cm layers. For bank protection, only rough stone pitching should be used for reasons of economy.

Stone pitching in continuous lengths will be divided suitably in panel by stone masonry walls 45 cm wide and equal to a depth of pitching with cement mortar 1 : 6 or otherwise specified in such a way that total enclosed area does not exceed 10 sq.m.

11.0 FLOORING

11.1 Base

The base shall consist of dry rammed moorum or dry rammed quarry refuse of 15 cm thickness as decided by the Engineer- in-Charge.

11.2 Drop Walls & Curtain Walls

The drop walls both on the upstream and downstream shall be built in Cement concrete as specified in the Drawing. On the upstream side the foundation shall be taken to a depth of 90 cm below the bed level while on the downstream side it shall be taken to a sufficient depth and to effectively dissipate the hydraulic head due to high flood level and afflux thereby preventing seepage underneath the flooring towards the downstream side. Alternatively, the depth of the drop walls and the length of the flooring should be as shown in the drawings so that the minimum flow is longer than the piping gradient line. The foundation for the drop wall shall also be laid in cement concrete and dimensions shall be in accordance with the drawings.

11.3 Aprons

11.3.1 Aprons are provided at the toes of Banks in continuation of the slope pitching for affording protection to the banks. These are provided to overcome the effects of scour that will be caused in the bed of the river at this location due to high velocities, whirls etc. Aprons are provided in such a manner that they can launch slope pitching below bed level and extending beyond scour level. Hence such aprons are provided in form of loose stones to a predetermined thickness and width.

11.3.2 A base consisting of smaller stones not exceeding 25 Kg in weight and not exceeding 20 cm in any direction shall be laid first over a layer of stones varying from 25 to 60 Kg in weight. The stones in the pitching shall be laid in such a way that the longest side is bedded vertically. Aprons shall be grouted by the cement mortar as specified in the drawing.

11.4 **Payment**

Measurement will be taken in Cubic meters for pitching and flooring where thickness is predetermined and specified uniformly in drawing.

12.0 **MISCELLANEOUS**

Stone masonry random rubble/coursed rubble/dry course rubble would be used in breast/retaining walls, drop and curtain walls, top, toe and intermediate walls of supporting panels in pitching and flooring in bridges as shown in the drawing and/or as directed by the Engineer-in-Charge.

12.1 **Weep Holes**

75/100mmdia weep hole along with filter media at back would be provided in retaining walls at regular intervals as specified in the drawings/directed by the Engineer-in-Charge. Keeping these holes would be a part of the masonry work/ concrete but no deduction would be made in the quantities for holes.

12.2 The following IS codes apply for the special works: -
a) IS-2911 code of practice for construction of pile foundation (with bored piles)

13.0 The contractor shall submit royalty clearance certificate for the material used in RCC, PCC, boulder work etc. with related R/A Bill. If the agency fails to do so, the required amount will be deducted as per extant Govt. rule, from his bill and will be deposited with the concerned dept.

14.0 **WATER BOUND MACADAM ROAD WORKS**

14.1 General

The works shall be carried out in accordance with provisions in CPWD Specifications. Chapter 17 on Road Works.

14.2 Materials

14.2.1 Coarse Aggregates

Para 17.1.1 of CPWD Specifications may be referred to. The Physical requirements have been outlined in Table 17.1 and Grading requirements of size range 90mm to 45mm and 63mm to 45mm in Table 17.2.

14.2.2 Fine Aggregates

Para 17.1.2 of Specifications may be referred to.

14.3 Preparation of Sub-Grade

Para 17.6 may be referred to.

14.4 Sub Base

The Sub Base shall consist of Water Bound Macadam with Stone aggregate of size 90mm to 45mm. Para 17.7.2 of CPWD Specifications may be referred to. Base

The Base Course shall consist of Water Bound Macadam with Stone aggregate of size 63mm to 45mm. Para 17.8.1 of CPWD Specifications may be referred to.

14.5 Surface Course

100mm thick Surface course over Water Bound Macadam surface shall be provided as detailed in the relevant item in the BOQ.

ANNEXURE A

GRADE MIX CONCRETEWORKS TESTS ON CONCRETE SAMPLING, STRENGTH TESTING AND ACCEPTANCE CRITERIA

EXTRACTED FROM CONCRETE BRIDGE CODE (REVISED – 1997)

Note: Unless otherwise specified in the Contract the cost of tests including Materials, labour and testing charge in Laboratory will be borne by the contractor.

8.7 **Sampling, Strength Tests and Acceptance Criteria**

8.7.1 General

Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

8.7.1.1 In order to get a relatively quick idea of the quality of concrete, optional tests on beams for modulus of rupture at 72 $\pm$ 2 hours or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values given in **Table 7** may be taken for general guidance in case of concrete made with ordinary Portland cement. In all cases, the 28 days compressive strength specified in **Table 2** shall alone be the criterion for acceptance or rejection of the concrete.

(Note: -Table 2 is on "Grading Concrete" in terms of which the specified characteristic compressive strength at 28 days in N/mm^2 is 20 in case of M-20, 25 in case of M-25 and so on).

TABLE 7 - OPTIONAL TESTS REQUIREMENTS OF CONCRETE (Clause 8.7.1.1)

GRADE OF CONCRETE	COMPRESSIVE STRENGTH ON 15 CM CUBES (N/mm^2)	MODULUS OF RUPTURE BY BEAM TEST Min. (N/mm^2)	
	Min. at 7 days	At 72 + 2 h	At 7 days
(1)	(2)	(3)	(4)
M 20	13.5	1.7	2.4
M 25	17.0	1.9	2.7
M 30	20.0	2.1	3.0
M 35	23.5	2.3	3.2
M 40	27.0	2.5	3.4
M 45	30.0	2.7	3.6
M 50	33.5	2.9	3.8
M 55	37.0	3.1	4.0
M 60	40.0	3.3	4.2

8.7.2. **Frequency of Sampling**

8.7.2.1 **Sampling Procedure -** A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested: that is, the sampling should be spread over the entire period of concreting and cover all mixing units.

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

Quantity of concrete in the work m^3	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional $50m^3$ or part thereof.

NOTE - At least one sample comprising of 3 cubes shall be taken from each shift.

8.7.3 **Test Specimen** - Three test specimens shall be made from each sample for testing at28 days. Additional cubes may be required for various purposes such as

to determine the strength of concrete at 7 days or at the time of striking the form work, or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in IS: 9013. The specimen shall be tested as described in IS: 516.

8.7.4. **Test Strength of Samples –** The test strength of the sample shall be the average of the strength of three specimens. The individual variation should not be more than $\pm$ 15 percent of the average. If more, the test results of the sample are invalid. When individual variation exceeds this limit, the procedure for the fabrication of specimen and calibration of the testing machine should be checked.

8.7.5 **Standard Deviation**

8.7.5.1 **Standard Deviation Based on Test Results**

(a) **Number of Test Results:** The total number of test results required to constitute an acceptable record for calculation of standard deviation shall not be less than 30. Attempts should be made to obtain 30 test results, as early as possible, when a mix is used for the first time.

(b) **Standard Deviation to be brought up to date:** The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once a month.

8.7.5.2 **Determination of Standard Deviations** (Not given in this Annexure)

8.7.5.3 **Assumed Standard Deviation –** of concrete are not available, the value assumed.

Where sufficient test results for a particular grade of standard deviation given in **Table 8** may be assumed.

TABLE 8 - ASSUMED STANDARD DEVIATION (Clause 8.7.5.2)

GRADE OF CONCRETE	ASSUMED STANDARD DEVIATION N/mm^2
M 20	4.6
M 25	5.3
M 30	6.0
M 35	6.3
M 40	6.6
M 45	7.0
M 50	7.4

M 55	7.6
M 60	7.8

However, when adequate past records for a similar grade exist and justify to the designer a value of standard deviation different from that shown in **Table 8**, it shall be permissible to use that value.

8.7.6 **Acceptance Criteria**

8.7.6.1 **Compressive Strength**

When both the following conditions are met, the concrete complies with the specified compressive strength:

(a) The mean strength determined from any group of four consecutive test results complies with the appropriate limits in column A of **Table.9**.; and

(b) Any individual test result complies with the appropriate limits in column B of **Table.9**.

8.7.6.2 **Flexural strength**: when both the following conditions are met, the concrete complies with the specified flexural strength:

(a) The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm^2.

(b) The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm^2.

TABLE 9 CHARACTERISTIC COMPRESSIVE STRENGTH COMPLIANCE REQUIREMENTS

(Clauses 8.7.6.1 & 8.7.6.2)

Specified grade	Group of test results	A The mean of the group of test results exceeds the specified characteristic compressive strength by at least N/mm^2	B Any individual test result is not less than the specified characteristic compressive strength less N/mm^2
M20 & above	Any consecutive 4 Tests	3	3

Special Note for Table. 9

8.7.6.3 **Quantity of Concrete Represented by Strength Test Results**

The quantity of concrete represented by a group of 4 consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches.

For the individual test result requirements given in column B of **Table 9** or in item (b) of para 8.7.6.2 only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified the maximum quantity of concrete that four consecutive test results represent shall be limited to 60 m^3.

8.7.6.4 If the concrete is deemed not to comply pursuant to para 8.7.6.2 the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken.

8.7.6.5 Concrete of each grade shall be assessed separately.

8.7.6.6 Concrete shall be assessed daily for compliance.

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

ANNEXURE B

CUBE TEST FOR COMPRESSIVE STRENGTH OF CONCRETE

A-0 One sample (consisting of six cubes 15 x 15 x 15 cm) shall be taken for every 20 cum or part thereof of concrete work, ignoring any part less than 5 cum or as often as considered necessary by the Engineer. The test of concrete cubes shall be carried out in accordance with the procedure as described below. A register of cubes shall be maintained at the site of work. The casting of cubes, concrete used for cubes and all other incidental charges such as curing, carriage to the testing laboratory shall be borne by the Contractor The testing fee for the cubes, if any, shall also be borne by the Contractor unless the contract provides otherwise.

A-1 **Test Procedure**

A1.1 **Mould**

The mould shall be of size 15 cm x 15 cm x 15 cm for the maximum nominal size of aggregate not exceeding 40 mm. For concrete with aggregate size more than 40 mm. Size of mould shall be specified by the Engineer, keeping in view the fact that the length of size of mould should be about four times the size of aggregate.

The moulds for test specimens shall be made of non-absorbent material and shall be substantially strong enough to hold their form during the moulding of test specimens. They shall not vary from the standard dimensions by more than one percent. The moulds shall be so constructed that there is no leakage of water from the test specimen during moulding. All the cube moulds for particular site should, prior to use, by checked for accuracy in dimensions and geometric form and such test should at least be made once a year.

Each mould shall be provided with a base plate having a plane surface and made of non-absorbent material. This plate shall be large enough in diameter to support the moulds properly without leakage. Glass plates not less than 6.5 mm thick or plain metal not less than 12 mm thick shall be used for this purpose. A similar plate shall be provided for covering the top surface of the test specimen when moulded.

Note: Satisfactory moulds can be made from machine or steel castings, rolled metal plates or galvanized iron.

A.1.2 **Sample of Concrete**

Sample of concrete for test specimen shall be taken at the mixer or in the case of ready mixed concrete from the transportation vehicle discharge or as directed by the Engineer. Such samples shall be obtained by repeatedly passing a scoop or pail through the discharge stream of concrete. The sampling operation should be spread over evenly to the entire discharging operation. The samples thus obtained shall be transported to the place of moulding of the specimen. To counteract segregation, the concrete shall be mixed with a shovel until it is uniform in appearance. The location in the work of the batch of concrete thus sampled shall be noted for further reference. In case of paving concrete, samples shall be taken from the batch immediately after deposition of the sub-grade. At least five samples shall be taken from different portion of the pile and these samples shall be thoroughly mixed before being used to form the test specimen. The sampling shall be spread as evenly possible throughout the day. When wide changes occur during concreting, additional samples shall be taken if so desired by the Engineer.

A.1.3 **Preparation of Test Specimens**

The interior surfaces of the mould and base plate shall be lightly oiled before the concrete is placed in the mould. The samples of concrete obtained as described under the test specimen shall be immediately moulded by one of the following methods as indicated below: -

When the job concrete is compacted by manual methods, the test specimen shall be moulded by placing the fresh concrete in the mould in three layers, each approximately one third of the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a uniform distribution of concrete within the mould. Each layer shall be pounded 35 time with 16mm rod, 60 cm in length, bullet pointed at the lower end. The strokes shall be distributed in uniform manner over the cross section of the mould and shall penetrate into underlying layer. The bottom layer shall be pounded through its depth. After the top layer has been rodded, the surface of the concrete shall be struck off with a trowel and covered with a glass plate at least 6.5 mm thick or a machined plate. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of water- cement ratio of the concrete by loss of water, either by leakage from the bottom or ever flow from the top of the mould.

When the job concrete is placed by vibration and the consistency of the concrete is such that the test specimens cannot be properly moulded by hand-rodding as described above, the specimens shall be vibrated to give a compaction corresponding to that of the job concrete. The fresh concrete shall be placed in mould in two layers, each approximately half the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to

ensure a symmetrical distribution of concrete within the mould. Either internal or external vibrators may be used. The vibration of each layer shall not be continued longer than is necessary to secure the required density. The internal vibrators shall vibrate only the layer to be compacted. In compacting the first layer, the vibrators shall not be allowed to rest on the bottom of the mould. In placing the concrete for top layer there should be no mortar loss during vibrations. After vibrating the second layer enough concrete shall be added to bring level above the top of the mould. The surface of the concrete shall then be struck off with a trowel and covered with a glass or steel plate as specified above. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of water-cement ratio of the concrete by loss of water, either by leakage from the bottom or over flow from the top of the mould.

A.1.4 **Curing and Storage of Specimen**

In order to ensure reasonably uniform temperature and moisture conditions during the first 24 hours for curing the specimen and to protect them from damage, moulds shall be covered with wet straw or gunny sacking and placed in a storage box so constructed and kept on the work site that its air temperature when containing concrete shall remain 22^{o}C to33^{o}C, Other suitable means which provide such a temperature and moisture conditions may be used.

Note: - It is suggested that the storage box be made of 25 mm dressed tongued and grooved timber, well braced with battens to avoid warping. The box should be well painted inside and outside and should be provided with a hinged cover and padlock.

The test specimen shall be removed from the moulds at the end of 24 hours and stored in a moist condition at a temperature within 24^{o}C to 30^{o}C until the time of test. If storage in water is desired, a saturated lime solution shall be used.

A.1.5 **Testing**

The specimens shall be tested in accordance with procedure as described below: -

(a) The tests shall be made at an age of concrete corresponding to that for which the strengths are specified.

(b) Compression tests shall be made immediately upon removal of the concrete test specimen from the curing room i.e. the test specimen shall be loaded in damp condition. The dimensions of the test specimens shall be measured in mm accurate to 0.5 mm.

(c) The metal bearing plates of the testing machine shall be placed in contact with the ends of the test specimens. Cushioning materials shall not be used. In the case of cubes, the test specimen shall be placed in the machine in such a manner that the load is applied to sides of the specimens as cast. An adjustable bearing block shall be used to transmit the load to the test specimen. The size of the bearing block shall be the same or slightly larger than that of test specimen. The upper or lower section of the bearing block shall be kept in motion as the head of the testing machine is brought to a bearing on the test specimen.

(d) The load shall be applied axially without shock at the rate of approximately 140 kgs. per/ Sq.cm. per minute. The total load indicated by the testing machine at failure of test specimen shall be recorded and the unit compressive strength is calculated in kg per sq.cm. using the area computed from the measured dimensions of the test specimen. The type of failure and appearance of the concrete shall be noted.

TECHNICAL SPECIFICATIONS FOR TRACK BALLAST

SPECIFICATIONS FOR SUPPLY OF BALLAST (BASED ON IRS-GE-1/JUNE-2004)

1.0 **Ballast Supply**

1.1 This specification will be applicable for stone ballast to be used for all types of sleepers on normal track, turn-outs, tunnels and deck slabs etc. on all routs.

2.0 **Quality of Stone Ballast in Genera**l

2.1 **Basic Quality:** Ballast should be hard durable and as far as possible angular along edges/corners, free from weathered portions of parent rock, organic impurities and inorganic residues.

2.2 **Particle Shape:** Ballast should be cubical in shape as far as possible. Individual pieces should not be flaky and should have generally flat faces with not more than two rounded/ sub- rounded faces.

2.3 **Mode of Manufacture:** The ballast shall be machine crushed and conforming to the Railway specifications for machine crushed ballast.

2.4 **Physical Properties:** The ballast samples when tested for physical properties (abrasion and impact) in accordance with IS: 2386 (Part-IV)-1963 should have the under mentioned values:

(i) Aggregate Abrasion Test (Using 105 Angles Abrasion Testing Machine).

(ii) Aggregate Impact Test.
Impact values (Percent) – Maximum 20%

2.5 The water absorption test as per IS: 2386, Part-III-1963, which should not be more than **2.5%** vide correction slip-3 issued by Railway Board**.**

2.6 Track ballast should be obtained from good quality stones / boulder; and top layer, if weathered, must not be used.

3.0 **Size and Gradation of Ballast**

3.1 The track ballast shall be well graded of the following size: -

(a) Retained on 65 mm square mesh sieve - 5% maximum.
(b) Retained on 40 mm square mesh sieve* - 40% to 60%
(c) Retained on 20 mm square mesh sieve -not less than 98% for machine crushed.
- not less than 95% for hand broken.

* For machine crushed ballast only.

4.0 Over-size and under-size Ballast

4.1 Over-size Ballast Tolerances

4.1.1 Retention on 65 mm square mesh sieve: A maximum of 5% ballast retained on 65 mm square mesh sieve shall be allowed without deduction of in payment.

In case ballast retained on 65 mm square mesh sieve exceeds 5% but does not exceed 10%, payment at 5% reduction in contracted rate shall be made for the full stack. Stacks having more than 10% retention of ballast on 65 mm square mesh sieve, the stack shall be rejected.

In case ballast retained on 40 mm square mesh sieve (machine crushed case only) exceeds 60% limit prescribed in 3.1 (b) above, payment at following reduced rates shall be made for the full stack in addition to the reduction worked out at 4.1.1 above.

5% reduction in contracted rate shall be made if retention on 40 mm Square mesh sieve is between 60% (excluding) and 65% (including).

10% reduction in contracted rate shall be made if retention on 40 mm Square mesh sieve is between 65% (excluding) and 70% (including).

4.1.2 In case retention on 40 mm square mesh sieve exceeds 70%, the stack shall be rejected.

4.1.3 In case of Hand broken ballast supply, 40 mm sieve analysis may not be carried out. The executive may however ensure that the ballast is well graded between 65 mm and 20 mm.

4.2 Under-Size Ballast – Tolerances

The ballast shall be treated as under-sized and shall be rejected if-

4.2.1 Retention on 40 mm Sq. mesh sieves less than 40%.

4.2.2 Retention on 20 mm Sq. mesh sieve is less than 98% (for machine crushed ballast) or 95% (for Hand broken ballast).

5.0 **Sieve Analysis for Size and Gradation**

The screens for sieving ballast shall be of square mesh and shall not be less than 100cm in length, 70cm in breadth and 10cm in height on the sides. The squareness of the individual hole in the sieves viz. 65, 40 and 20 mm should be ensured. The sieves to be used for the sieve analysis.

Sieve sizes mentioned above are the nominal sizes. However, the following tolerances in the sizes of holes for 65, 40- and 20-mm nominal sizes are permitted.

65mm square mesh sieve plus minus (±) 1.5mm
40mm square mesh sieve plus minus (±) 1.5mm
20mm square mesh sieve plus minus (±) 1.0mm

When carrying out sieve analysis, the screen shall not be kept inclined, but held horizontally, and shaken vigorously. The pieces of ballast retained on the screen can be turned with hand to see if they pass through but should not be pushed through the screen openings.

The percentage of ballast passing through or retained on the sieve shall be determined by weight.

6.0 **Sampling of Ballast**

6.1 A minimum of 3 samples of ballast for sieve analysis shall be taken for measurement done on any particular date even if the numbers of stacks to be measured are less than three.

6.2 The test viz. determination of Abrasion value, Impact value and water absorption value should be got done through the following laboratories/Govt. Institutions.

Any Zonal Railway Laboratory or any Railway approved Laboratory/ Institution.
National Test House, Alipore, Kolkata
NHIDCL Laboratory (where available),
Any Govt. laboratory/institution

6.3 In order to ensure supply of uniform quality of ballast, the following norms shall be followed in respect of sampling, testing and acceptance.

6.3.1 On supply of first 100 cum. the test for size, Gradation, Abrasion value, Impact value and water absorption value (as prescribed) shall be carried out. Further supply shall be

accepted only after this ballast satisfies the specification for these tests. NHIDCL reserves the right to terminate the contract at this stage itself in case the ballast supply fails to conform to any of these specifications.

6.3.2 All Costs towards the laboratory test should be borne by the contractor.

6.3.3 Subsequent tests shall be carried out as follows:

S.N.		Supply in Stacks	
		For each stack of volume less than 100 cum	For each stack of volume more than 100 cum.
(a)	Size & Gradation Test: - Testing frequency -------- Size of sample ----------	One for each stack. 0.027 cum	One for each stack ** 0.027 cum. for every 100cum or part thereof.
(b)	Abrasion value, Impact value and Water absorption Tests **: - Testing frequency --------	One for every 2000 cum.	

** This sample should be collected using a wooden box of internal dimension 0.3m x 0.3m x 0.3m from different parts of the stack/wagon.

These tests shall be done for the purpose of maintaining quality during supply. In case of the test results not being as per the prescribed specifications at any stage, further supplies shall be suspended till suitable corrective action is taken and supplies ensured as per the specifications.

The above tests may be carried out more frequently if warranted at the discretion of Engineer-in-charge of NHIDCL.

All tests for Abrasion value, Impact value and water absorption value conducted subsequently after award of contract shall be done as per direction of In-charge of the work at contractor cost.

6.4 In the event of the ballast being rejected the Contractor/Agency will have to remove the rejected ballast from the work-site expeditiously at his own cost.

6.5 The Engineer shall mark all rejected ballast in any manner he considers fit to prevent them from being removed and mixed with good/accepted ballast and the Contractor shall within a fortnight from the date of the order of removal, remove the rejected ballast to such place as may be directed by the Engineer and, in the event of contractor's failure to do so the Engineer may cause it to be removed and all costs of such removal shall be payable on demand by the Contractor to NHIDCL and without prejudice to any other mode of recovery, may be deducted from any money, that may be due or may become due to the contractor or from the Contractor's bill for any other works executed for NHIDCL on behalf of Employer.

6.6 Should NHIDCL, under any special circumstances, agree to take over all or part of the rejected ballast, the same will be paid for at rates to be fixed by the authority accepting the tender and agreed to by the contractor in writing.

7.0 The screen for sieve analysis as specified in specification as also the standard box for measuring volume should be kept available at site by the contractor at his own cost, for use by the Engineer or his representative after proper check, in carrying out sieve analysis. Labours required for doing sieve analysis will be supplied by the contractor free of cost. The contractor must also accept the results of such analysis in writing.

8.0 Each stack of ballast shall be serially numbered and may be as long and broad as possible. After the stacks are measured, they should be sprinkled with lime in the form of cross on all the sides of the stack at the contractor's own cost to the satisfaction of the Engineer-in-Charge of NHIDCL. Suitable space should be left in between stacks in adjacent zones so that there is no possibility of materials of fresh stacks in one zone mixing with stacks already measured in the adjacent zone.

9.0 Entries in the ballast measurement register should not be over written. If any correction is required the same should be done by striking off the old entry by drawing a line and showing proper entry by its side.

10.0 Ballast is to be stacked proper trapezoidal section on the cess or berms, or on the line or in depots as may be ordered by the Engineer concerned, in stacks as large as possible and ordinarily not less than 1.0 metre in height except hilly areas where it may 0.5 m. The height shall not be more than 2.0 m. Top width of the stack shall not be less than 1.0 metre. Top of stack shall be kept parallel to the ground plane. The side slopes of stack should not be flatter than 1.5: 1 (Horizontal: Vertical). Cubical content of each stack shall normally be not less than 30 (thirty) cum in plain areas and 15 cum in hilly areas.

11.0 The Engineer should, as far as possible, set out the sites for ballast stacks. Stacking ground must be fairly dressed to a proper plane by the contractor at his own cost before

stacking is started. Completed stacks must be properly finished before being offered for acceptance and measurement.

12.0 It must be distinctly understood that the accepted rate is for ballast which conforms in all particulars of quality, stack measurements, gauge, completion within time limit and delivery at site fixed upon, with the specification and conditions of contract. If, therefore, the officer deputed to measure up a Contractor's ballast is not satisfied that the above conditions and specifications have been complied with, he is at liberty to take either of the following courses.

To refuse to measure up such ballast at all giving his reasons in writing for so doing to the Contractor.

To call upon the contractor in writing to screen his ballast of dirt and admixtures beyond the specified limit or to break it to gauge, or to re-stack it to proper dimensions, or all three as may be required, prior to further inspection and measurement by a fixed date, within the time limit imposed in the agreement.

13.0 The contractor shall provide at his own cost adequate labour and tools for opening out stacks for inspection and for carrying out screening test.

14.0 The contractor shall supply all necessary tools for the work and also bamboos, pegs, strings etc. necessary for measurement of ballast.

15.0 **Wagon Measurement**

In case ballast supply taken by direct loading into wagons, a continuous white line should be painted inside the wagon to indicate the level to which the ballast should be loaded. The cubical content in cubic meter corresponding to white line should also be painted on both sides outside the wagon.

In addition to painted line, mentioned in para 15(i) above, short pieces of flats (cut pieces of tie bars or otherwise) with cubical contents punched shall be welded at the centre of all the four sides as permanent reference. In case the supply is taken in general service wagon, actual measurements will be taken.

16.0 **Shrinkage Allowance**

Payment shall be made for the gross measurement either in stacks or in wagons without any deduction for shrinkage/voids. However, when ballast supply is made in wagons, shrinkage upto 8% shall be permitted at destination while verifying the booked quantities by the consignee.

17.0 **Stack Measurement**

The quantity shall be calculated as per the following formula for the ballast supplied.

$$Q = \frac{LB + LT}{2} \times \frac{WB + WT}{2} \times H$$

When, Q = Quantity of Ballast

LB = Average length of the stack at the bottom.
LT = Average length of the stack at the top
WB = Average width of the stack at the bottom
WT = Average width of the stack at the top
H = Average height of the stack.

The plan of the stack should be either square or rectangular.

TECHNICAL SPECIFICATIONS FOR THERMIT WELDING OF RAILS

ANNEXURE - 'A'

TECHNICAL SPECIFICATION FOR THERMIT WELDING

1.0 **Portion for Welding**

1.1 The 'portion' used for welding shall conform to the technical requirements as mentioned in IRS: T-19-1994. The suitability of the 'portion' for the welding process in respect of the type and section of rails to be welded shall be ensured before commencing welding. Only RDSO certified/passed portions should be used for welding.

1.2 **Equipment and staff for welding:** The list for one set of A.T. welding equipment by short preheating process is given in Annexure 2. The composition of thermit welding team is given in Annexure 3.

1.3 **Preparation of rail ends to be welded:** The rail end face and adjacent sides at foot (top and bottom), web and head up to 50 mm shall be thoroughly cleaned using kerosene oil and brushing with wire brush to remove all dirt, grease and rust before welding. Any burrs at the rail ends shall be removed by chiselling or grinding.

Normally, no alumino -thermic welded joint shall be located closer than 4m from any other welded or fish plated joint.

1.4 **Gap between rail ends**: The two rail ends to be welded shall be held in position with a uniform and vertical gap asper gap specified in Annexure 1. The uniformity and verticality of the gap shall be measured by a gauge prior to welding. In case of wide gap 50 ±1 / 75 ± 1 mm welding, for repairing fractured /defective welds, it shall be ensured that the end faces are vertical. In LWR/CWR territory, hydraulic/mechanical rail tensor of suitable and approved design should be used for maintaining correct rail gap during welding.

1.5 **Preliminary work prior to welding**

1.5.1 In case of in-situ welding the rail fastenings for at least five sleepers on either side of the proposed weld shall be loosened. The sleepers adjacent to the joint to be welded shall be shifted to obtain a clear working space of 250 mm on either side to accommodate the moulds, clamps, preheating equipment, etc. The rails shall then be properly aligned, both horizontally and vertically.

1.5.2 When the welding work is carried out on cess, full rail length shall be levelled by supporting on at least ten wooden blocks on either side. The rails shall be properly aligned in horizontal and vertical direction and held in position.

1.6 Alignment of Rail Ends before Welding

1.6.1 The rail ends to be welded shall be aligned in horizontal and vertical planes to the dimensional limits indicated below.

1.6.1.1 **Lateral Alignment**: The two rail ends, after alignment shall be within $\pm$ 0.5 mm. when checked with a 1.0 m straight edge at rail ends [Fig. 4.7.1.1(a) & (b)]. Any difference in the widths of rail heads shall always be fully kept on the non-gauge side, correctly aligning the rail ends on the gauge face.

1.6.1.2 **Vertical Alignment**: The joint shall be kept higher by 3 to 4 mm for 72 UTS rails and 2 to 2.4 mm for higher UTS rails when measured at the end of 1 m straight edge (as compensation against sagging caused by differential shrinkage on cooling) (Fig. 4.7.1.2). This shall be achieved by wedges applied on the rail supporting blocks on both sides of the joint.

1.7 Fixing of Mould

1.7.1 Only prefabricated moulds supplied by the portion manufacturer shall be used for welding. These are to be made by mixing high silica sand to IS: 1987 with sodium silicate to the required consistency, followed by passage of carbon dioxide gas. These prefabricated moulds shall have adequate permeability for escape of mould gases and adequate reinforcement to avoid mould crushing during transportation and welding.

1.7.2 Before mounting on the rail ends to be welded, each pair of moulds shall be examined for defects, dampness, cracks, blocked vents, etc. and defective moulds discarded. The prefabricated moulds shall be handled with care as they are fragile and liable to breakage.

1.7.3 During fixing the moulds, it shall be ensured that the Centre line of the rail gap coincides with Centre line of the mould to avoid cross joint. The mould jackets/shoes holding the pre-fabricated mould in a snug fit condition, after fixing, shall be tightened by the application of adequate pressure. Excessive pressure may cause breakage of mould and dropping of sand inside the mould cavity. Care shall be taken during application of adequate pressure; it is essential for the moulds to fit flush to each other across the bottom of the rail flange which can be checked by feeling with fingers across the junction of the two halves of

the moulds and by looking down the riser aperture. The moulds should touch the bottom of rail foot to ensure proper size of collar at the bottom.

1.7.4 After fixing the moulds, the gap between mould and the rail shall be packed firmly with luting sand to prevent leakage of liquid weld metal. To protect the rail top table from metal splashes during reaction, the adjacent rail surface on either side of the moulds shall be covered with metal cover or smeared with luting sand upto 15 cm. on either side.

1.8 **Preheating**

1.8.1 After fixing and luting of the moulds, the rail ends shall be uniformly pre-heated throughout the rail section with specially designed air petrol/compressed air petrol/oxygen-LPG burner as the case may be. The flame shall be properly adjusted to achieve the desired rail temperature. The pre-heating shall be done from the top of the mould box for stipulated period for welding technique adopted, so as to achieve a temperature of around 600 ± 20^0C.

1.8.2 In welding process using air petrol burner, the compressor tank pressure during operation of the burner shall be maintained at 7 ± 0.70 kg/cm^2 (100 ± 10 lb per sq.in). In case of pre-heating by oxygen and LPG cylinders shall be adjusted in the range of 7.0-8.0 kg/cm^{2}and 2.0-2.5 kg/cm^2 respectively. While preheating with oxy-LPG burner LPG supply should be opened first and the gas ignited, thereafter oxygen supply should be opened. While closing, oxygen supply should be stopped first followed by LPG supply. The burner shall be properly adjusted during preheating to ensure that the head, web and foot of both the rail ends are heated uniformly.

1.8.3 **Preheating Time:** Preheating time would be about 10 to 12 minutes and 2 to 2.5 minutes for air-petrol and oxy-LPG preheating techniques respectively. The actual preheating time would depend upon the rail section and welding technique adopted as given in Annexure 1.

1.8.4 Special emphasis shall be given to the tank pressure, efficiency of burner and flame condition for achieving required rail temperature within the stipulated time. From time to time or in case of any doubt with a view to maintain proper quality control, temperature measuring devices like optical pyrometer, contact type pyrometer or temperature indicating crayons may be used for measuring rail end temperature just after completion of preheating i.e. after removal of burner.

1.9 Welding

1.9.1 The crucible lined with refractory material (magnesite/crushed alumina slag) and fitted with bottom stone and thimble shall be preheated before making the first weld of the day to ensure freedom from moisture.

1.9.2 Slag shall be cleaned from the crucible after each reaction, if necessary. During cleaning, care shall be taken not to damage the refractory crucible lining. The lining shall be examined regularly and patch repairing, or relining as necessary shall be carried out.

1.9.3 The crucible shall be positioned relative to the pouring gate with respect to its height from the mould after it has been placed on the stand mounted on the rail head. The tap hole in the crucible shall be sealed with closing pin, asbestos powder and stag power. The 'portion', for the required technique, shall be thoroughly hand mixed and poured into the crucible striking the crucible wal so that the bottom plugging remains undisturbed. The portion shall be coned to the Centre of the crucible and a sparkler be placed at the top. The crucible shall then be brought to the proper position over the mould in line with the pouring gate of the mould with a vertical distance of about 50 mm. between the tap hole and sand core/top of the pouring gate.

1.9.4 After preheating the rail joint, the sparkler shall be ignited and inserted in the portion at the Centre top to start the reaction. The reaction shall not be vigorous or boiling. By the time the reaction is completed the burner shall be removed quickly and the gap closed with a dried sand core in case of central pouring to prevent loss of heat and turbulence during flow of metal. The time period between removal of burner and tapping of metal should be as minimum as possible. After the reaction subsides, about three seconds shall be allowed for the separation of slag from the metal, which may be judged by looking into the crucible through coloured glass to IS: 5983. Thereafter, the molten steel shall be tapped into the mould by striking the closing pin with a tapping rod. It shall be ensured that since the commencement of the reaction, thermit steel is tapped within the time limit as specified in Annexure 1. Care shall be taken to ensure that the crucible does not move from its position during tapping. When pouring is over, the crucible and swivel stand shall be removed and kept aside without disturbing the joint. If the reaction is found to be boiling, the metal shall be out-tapped. Vivorous reaction and loose closing of crucible may cause self-tapping. In this case also, the metal shall be out tapped. If, in any case, self-tapped metal enters the mould, the joint shall be rejected, cut and re-welded. In cases of out tapping, the joint should be cooled to ambient temperature and the process of welding restarted a fresh. However, if temperature can be measured, the rail end

may be heated to an extent so as to achieve temperature of about $600^{+}_{-}20^{0}$ and welding of joint may be completed.

1.9.5 After pouring, molten metal shall be allowed to cool and solidify with mould intact for the stipulated time (mould waiting time) depending upon the rail section and ambient temperature. In case of alloy steel rails, full rail section up to 300 mm on either side of the joint shall be heated by using burner during this period. The mould shoes shall be removed just prior to completion of mould waiting time. The mould waiting time is generally four to six minutes for 25 mm gap joints. After the mould waiting time has elapsed, the trimming should be done by using weld trimmer of suitable and approved design without knocking out the mould. List of approved manufacturers of rail profile weld grinder and weld trimmer is given at Annexure 4.

In the ventuality of sudden failure of weld trimmer, manual chipping may be resorted to. In case of welding of old rails, if it is not possible to use weld trimmer due to flow of metal at rail head, manual chipping should be done.

1.9.6 During the trimming operation, it shall be ensured that the wedges used in aligning are in their proper places without loosening, and they are not removed for at least 20 minutes after stripping. The runner and riser must not be removed until cold, and that too only by knocking towards the rail.

1.9.7 No welding shall be carried out if it is raining. In case, the rains start while the joint is under execution, immediate arrangement to adequately cover the site shall be made.

2.0 Operations Subsequent to Welding

2.1 **Post Weld Cooling:** In case of welding of head hardened rails, the average hardness of the HAZ of the rail becomes considerably less than the parent rail hardness. This lower hardness is due to transformation of rail steel occurring at cooling rate much lower than that achieved during the original head hardening operation. Such a hardness difference can lead to differential plastic deformation during wheel rail contact which may cause localized cupping. Head hardened rails, therefore, must be subjected to controlled quenching for a specific time by the arrangement approved for the technique.

2.2 **Post Weld Packing of Sleeper:** Before the passage of traffic, the wedges used for aligning should be removed and joint sleepers which were shifted to obtain the clear gap of 250 mm on either side as per para 1.5.2 shall be re-shifted to the

original location and repacked. Packing of these re-shifted sleepers should be carried out gently and carefully.

2.3 **Passing of Traffic:** The first train should be allowed to pass on the newly welded joint only after 30 minutes have elapsed since pouring of weld metal. Necessary speed restriction shall be observed until the grinding operation is over.

2.4. Grinding

2.4.1 After the excess metal is trimmed off, the grinding of the remaining metal on the rail table and the sides of the rail head shall be carried out only with rail profile guided grinding trolley of approved design. Use of hand files should not be resorted to except in unavoidable circumstances. In the case of in-situ joints, the grinding shall commence only after the sleeper fastenings are reflexed, after the removal of wedges. The rail table shall first be ground down to original profile and checked by a one metre straight edge. This should be followed by grinding of the sides of rail head. The accuracy of grinding shall be checked by using 10 cm straight edge. While grinding, only light pressure should be applied and grinding wheel should be moved to and fro to avoid local overheating.

2.4.2 **Tolerances on Finished Welds:** All the finished joints shall be checked to ensure that the joint geometry is within the following tolerances:

(i) Vertical alignment: Variation not more than + 1.0 mm, -0 mm measured at the end of one metre straight edge.

(ii) Lateral alignment: Variation not more than $\pm$ 0.4 mm. -0 mm measured at the end of 10 cm straight edge.

(iii) Finishing of top surface: $\pm$ 0.4 mm, -0 mm measured at the end of 10 cm straight edge.

(iv) Head finishing on sides: $\pm$ 0.3 mm over gauge side of the rail head measured at the Centre of 10 cm straight edge.

Note: In specific cases, for joint geometry, in case of old rails, dispensations may be permitted by Chief Engineer.

The method of checking the geometry of welded joints is illustrated in Fig. 5.4.2.

2.5 **Record of Joint Geometry:** The details of geometry of each joint shall be jointly signed by the firm's and NHIDCL' representative and kept as record. Any joint

found not conforming to the above stipulations shall be cut and re-welded, free of cost, by the firm.

2.6 **Marking:** Each joint shall have a distinctive mark indicating month, year, agency, welder's code and weld number of the welded joint in the following manner.

Month	Last two digits of Year	Agency	Specific person number	Weld No.

This should be done by punching on an aluminium strip of suitable thickness and dimension of 30 x 100 mm which should be fixed to the web of the rail with epoxy adhesive at approximately 300 mm from the joint. The welded joints shall be serially numbered. Repair welds/additional welds done at a later date may be given continuing weld number. For example, the last Thermit weld number 88 and subsequently a Thermit weld has been executed, it shall be numbered 89, irrespective of its location. Engineer-in-Charge shall maintain 'Thermit Weld Register' as per Proforma given in Annexure 5. No punch marking should be done on the rail.

2.7 **Painting of Thermit Welds**

Painting of weld collar should be done on all welds to protect them against normal and severe corrosion immediately after the welding. The procedure of painting and specification of paint is outlined in Annexures 6 and 7.

3.0 **Accepted tests**

3.1 **Visual Inspection:** All the welded joints shall be examined carefully to detect any visible defect like cracks, blow holes, etc. Any joint, which shows any visible defect should be rejected.

1.2 **Dimensional check:** All finished joints shall be checked for dimensional tolerances which should be within the tolerances as specified in para 2.4.2.

1.3 **Ultrasonic flaw detection test:** All the fusion welded joints shall be ultrasonically tested and accepted by the purchaser or his representative as per the 'Procedure for ultrasonic testing of Thermit welded rail joints' given at Annexure 8. This testing shall be completed as early as possible but, in any case, before the contractor/welding team leaves the welding site.

1.4 **Re-welding of Defective Joints**

3.4.1 All the joints found to be defective as per acceptance tests as given in paras 3.1, 3.2 & 3.3 and/or joints failed in guarantee period as specified in para 4.3 will be cut and re-welded by the firm free of cost using their portions, equipment, labour and consumables.

3.4.2 Where one bad joint is required to be replaced by two new joints, the entire cost of both the joints shall be borne by the firm.

3.4.3 All the re-welded joints should meet the acceptance tests as indicated in paras 3.1 to 3.3.

3.5 **Sample Test Joint**

3.5.1 One out of every 100 joints welded shall be selected at random by the purchaser or by the inspecting officer within one month of welding and subjected to hardness, transverse load/ deflection tests and porosity as per clause 4.2 of IRS: T-19-1994 (reproduced partly as Annexure 9 for ready reference) and the joint shall comply with the provisions laid down therein.

3.5.2 If the sample test joint fails to satisfy any of the requirements of specification IRS-T-19-1994, the NHIDCL will be at liberty to suspend further welding. However, two more randomly selected joints from the same lot of 100 joints shall be subjected to re-tests as per clause 1.1of IRS-T-19-1994. Both the joints should clear all the tests. If this report is also not satisfactory, further welding of joints shall be suspended until the firm's welding technique has been examined and the same satisfies the requirements of IRS: T-19-1994.

3.6 **Guarantee**

3.6.1 Rail joints welded by a firm shall be guaranteed against failure for a period of one year from the date of welding the joints in track or from the date such welded joints made 'in cess' are inserted in the track. Any such welded joint which fails within the guarantee period shall be re-welded free of cost by firm as per stipulations of para 3.4

3.6.2 In case of failure of sample test joint (refer para 3.5), the period of guarantee for 100 joints represented by the sample joint shall be extended for a further period of one year. In case of failure of joints or joints exhibiting signs of failure by cracking within extended period of guarantee, the joints shall be re-welded free of cost by the supplier as per stipulations of para 3.4.

3.6.3 The welded joints with the extended period of guarantee shall be marked 'X' with yellow paint one the outer side of the web of the rail near the joint in addition to the marking prescribed in para 2.6. Such marked joints shall be kept under careful observation by the purchaser.

3.7 Other Requirements

3.7.1 Welding shall be supervised by trained welding supervisor and carried out by trained welder having valid competency certificate from RDSO/TPP, NR, Lucknow in their possession.

3.7.2 A welding supervisor shall supervise not more than two welding teams deployed within 50 m distance at a time.

3.8 Precautions

While carrying out welding at site, the following precautions shall be observed:

(i) It should be ensured that the portion being used matches with type and chemistry of rail.
(ii) Rail ends should be square.
(iii) Alignment of rail ends should be perfect as checked by straight edge.
(iv) Rail ends should be properly cleaned with kerosene oil and wire brushes.
(v) Stop watch should be provided to the welding supervisor at each welding site.
(vi) Pressure in the tanks/cylinder should be properly maintained during pre-heating.
(vii) Correct gap between rail ends at head, web and foot shall be ensured.
(viii) Correct gap between rail ends at head, web and foot shall be ensured.
(ix) Tightness of clips fitted with hose connections to compressor tank and burner shall be checked before commencing preheating.
(x) Nozzles of burners shall be cleaned periodically to avoid back-fire.
(xi) The compressor tank shall be kept at least 2 to 3 m away from the burner to prevent fire hazard.
(xii) The tapping shall be done within the time specified for that particular technique. Welding parameters for techniques presently being used are available at Annexure 1 for special type of welding i.e. 75 mm gap, combination joint, etc. the time of reaction and tapping shall be as stipulated by RDSO for that particular welding technique.
(xiii) Arrangements for giving first aid shall be available at site.
(xiv) Welders should be provided with gloves and coloured glasses.
(xv) Boiling portion shall be out tapped.

(xvi) No moist portion/torned portion bag shall be used for welding.

(xvii) Dampness in moulds can lead to porosity and early fatigue failure of welds.

(xviii) Only those contractual agencies as have clearance from the RDSO /Railway Board can execute welding work. Supply of portions must be from sources approved by RDSO/Railway Board.

(xix) Many weld failures show evidence of badly cut rail ends. The evenness and verticality of a rail cut depends solely upon the skill of the welder. With portable disc cutters, very little skill is required to produce good cut.

ANNEXURE -1

STATUS OF VARIOUS A.T. WELDING TECHNIQUES (AS ON 31.12.97)

I. India Thermit Corporation Ltd., Kanpur

1. Techniques with air-petrol pre-heating.

S. No	Welding Technique	Gap (mm)	Pre-heating Time (mm)	Reaction Time (sec)	Wt. Of portion (Kg)+ 2%	Remarks
1.	60Kg (90 UTS)	25+1	12	20+	13.4	Approved
2.	60Kg (72 UTS)	25+1	12	20+		
3.	52kg (90 UTS)	25+1	10	20+	11.8	Approved
4.	52kg (72 UTS)	25+1	10	20+	11.8	Approved

II. HARSHAD THERMIT INDUSTRIES, RAIPUR

1. Techniques with air-petrol pre-heating

S. No	Welding Technique	Gap (mm)	Pre-heating Time(mm)	Tapping Time (sec)	Wt. of portion (Kg)+2%	Remarks
1.	60Kg (90 UTS)	25+1	12	20+	13	Approved
2.	52kg.(90 UTS)	25+1	10-11	20+ 3	12.5	Approved
3.	52kg.(72 UTS)	25+1	10	20+ 3	12	Approved

III. Sagar Electrical & General Industries Hyderabad

1. Techniques with air-petrol pre-heating

S. No	Welding Technique	Gap (mm	Pre-heating Time(mm)	Tapping Time (sec)	Wt. Of portion (Kg)+2%	Remarks
1.	60Kg (90 UTS)	25+1	12	20+ 3	13.8	Approved
2.	60Kg (72 UTS)	25+1	10-12	20+ 3	12.5	Approved
3.	52kg (90 UTS)	25+1	10	20+ 3	11.0	Approved
4.	52kg (72 UTS)	25+1	10-11	20+ 3	11.0	Approved

IV. Raybon Metals Private Limited, Bilaspur

1. Technique with air-petrol pre-heating

S. No	Welding Technique	Gap (mm	Pre-heating Time(mm)	Tapping Time (sec)	Wt. of portion (Kg)+ 2%	Remarks
1.	52kg (90 UTS)	25+1	10	20+ 3	12.4	Approved
2.	52kg (72 UTS)	25+1	10	20+ 3	12.2	Approved

ANNEXURE-2

LIST OF EQUIPMENT FOR ALUMINO-THERMIC WELDING OF RAIL JOINTS BY SHORT PRE-HEATING PROCESS PER WELDING TEAM

S. No.	Description	Quantity	
		Mass Welding	Repair Welding
A.	**PRE-HEATING EQUIPMENT**		
A-1	**Air-petrol pre-heating**		
1	Pressure tanks with pressure gauges complete	2 Nos.	1 No.
2	Vaporisers (burner) complete	2 Nos.	1 No.
3	Nozzle crickers	4 Nos.	2 Nos.
4	Nozzle keys	1 No.	1 No.
5	Vaporiser stand	2 Nos.	1 No.
6	Goose neck attachment to vaporiser	4 Nos.	2 Nos.
A-2	**Compressed air-petrol pre-heating**		
1	Suitable compressor system with pressure gauges	2 Nos.	1 No.
2	Torch (burner) complete2Nos.1No.	2 Nos.	1 No.
3	Torch (burner) keys1No.1No.	1 No.	1 No.
4	Torch (burner) stand2Nos.1No.	2 Nos.	1 No.
5	Goose neck attachment to vaporiser4Nos.2Nos.	4 Nos.	2 Nos.
A-3	**Oxy-LPG pre-heating**		
1	Oxy-LPG torch (burner)	2 Nos.	1 No.
2	Oxygen cylinder with pressure gauge	2 Nos.	1 No.
3	LPG cylinder with pressure gauge	2 Nos.	1 No.
4	Torch (burner) stand	2 Nos.	1 No.
5	Connecting hose pipe	4 Nos.	2 Nos.
B	**OTHER EQUIPMENT**		
1	Crucible complete	2 Nos.	1 No.
2	Crucible caps	2 Nos.	1 No.
3	Crucible forks	2 Nos.	1 No.
4	Crucible stands	2 Nos.	1 No.
5	Crucible rings	2 Nos.	1 No.
6	Mould pressure (clamp)	2 Nos.	1 No.
7	Cleaning rod round	2 Nos.	1 No.
8	Tapping rod	1 No.	1 No.
9	Straight edge 1m long	2 Nos.	1 No.

10	Straight edge 10 cm long	2 Nos.	1 No.
11	Aluminium steel rod for thermal plugging	2 Nos.	2 Nos.
12	Leather washers for pump	4 Nos.	2 Nos.
13	Gap gauges and height gauge	2 Nos.	1 No.
14	Filler gauge	2 Nos.	1 No.
15	Tools for punching the marking	2 Nos.	1 No.
16	Mould shoes	6 Pairs	2 Nos.
17	Stop watches	1 No.	1 No.
18	Pyrometer/thermal chalk for measurement of rail temperature	1 No.	1 No.
19	Wooden wedges for rail alignment	24 Nos.	12 Nos.
20	First aid box filled with medicines, bandages, cotton etc.	1 No.	1 No.
21	Mirror 150 X 100 mm with handle	2 Nos.	1 No.
22	Tool box containing:		
(i)	Hot sets (chisels) (For emergency use only)	2 Nos.	2 Nos.
(ii)	Funnel tin (for pouring petrol)	1 No.	1 No.
(iii)	Adjustable spanner	1 No.	1 No.
(iv)	Hammer 1 Kg.	1 No.	1 No.
(v)	Sledge hammer double panel 5 Kg.	2 Nos.	2 Nos.
(vi)	Steel wire brush	1 No.	1 No.
(vii)	Blue goggles	2 Pairs	1 Pair
(viii)	Paint brush 50 mm	1 No.	1 No.
(ix)	Slag container (bowl)	2 Nos.	1 No.
(x)	Asbestos gloves	4 Nos.	2 Pairs
(xi)	Hose clips	4 Nos.	4 Nos.
(xii)	Pliers	1 No.	1 No.
(xiii)	Rail file 350 X 40 X 6 mm (For emergency use only)	4 Nos.	2 Nos.
(xiv)	Weld trimmer	1 No.	1 No.
23	Insulation hood for control cooling (for 110 UTS rail welding)	1 No.	1 No.
24	Rail profile guided grinding trolley	1 No.	1 No.
25	To ensure quality, protective clothing, shoes gear & leather gloves		

ANNEXURE-3

COMPOSITION OF THERMIT WELDING TEAM (COMPRESSOR TANK-WISE)

Description	Numbers
Welder Grade-I/Grade-II	1
Welder Grade-III / Skilled Artisan	2
Helper Khalasi / Khalasi	5
Gangman	As per work load

Note: The composition of welding team has been framed taking into account that trimming and grinding operation would be done by weld trimmer and rail profile grinder.

ANNEXURE 4

LIST OF APPROVED SUPPLIERS OF RAIL PROFILE WELD GRINDER AND WELD TRIMMER (AS ON 01.09.1997)

S. No.	Name of Machine	Approved supplier	
1.	Rail Profile Weld Grinder	(i)	M/s Indiana Machine D-151, Phase-VII, S.A.S. Nagar-160 055 (Near Chandigarh)
		(ii)	M/s Phooltas Tamper Pvt. Ltd. Layak Bhavan, Canal Road, Patna-800 001
		(iii)	M/s Rajasthan Mining & Engg. Pvt. Ltd. 65, Gopal Bari, Jaipur-302 001
		(iv)	M/s. ITC Ltd. 84/22, Fazalganj, Kanpur - 208 012
2.	Weld Trimmer	(i)	M/s CTR Manufacturing Trimmer Industries Ltd. Nagar Road, Pune - 411 014
		(ii)	M/s ITC Ltd. 84/22, Fazalganj, Kanpur-208 012

ANNEXURE 5

PROFORMA FOR THERMIT WELD REGISTER

S. No.	Date of Welding	Location Details				Rail		Bolt Hole Dist. (mm)
		Cess/Situ	Location	Line No.	L/R	Sect.	UTS	
1	2	3				4		

Portion Details				Welding Details			
Agency Code	Batch No.	Portion No.	Date of Manufacturing	Agency Code	Process	Supervisor	Welder Code
5				6			

Weld No.	Block Time		Date of Finish Grinding	Dimensional Toler on Finished Joint				USFD testing after Welding	
	From	To		On 1 m		On 10 Cm		Date	Result (Pass/Fail)
				Lat.	Ver.	Top	Side		
7	8		9	10				11	

In service failure details	Test Joint Date Removed	Repl. Weld Ref.		Signature of Engineer-in-Charge
Failure		Weld	Weld 2	
12	13	14		15

Date of Sending Test Jt. With ref.	Test Joint Results					
	Date of Results with ref.	Hardness (BHN) / Rail Weld HAZ Load (t) Def (mm)	Transverse Load	Porosity (%)	Date of marking 'X' for extended guarantee	Remarks
16	17					

ANNEXURE-6

PROCEDURE FOR PAINTING OF WELD COLLAR FOR THERMIT WELDED RAIL JOINTS TO PROTECT AGAINST NORMAL CORROSION

A. NEW WELDED JOINT

1. Surface Preparation

1.1 Remove dust, loose rust and mill scale by wire brushing.

1.2 Scrub welded area with water to make it free from slag and other water-soluble compounds. Make it dry.

2. Painting Procedure

2.1 Apply one coat of ready mixed paint, brushing, bituminous black, lead free, acid, alkali, water and chlorine resisting, conforming to IS: 9862-1981 on the welded area and 10 cm on either side.

2.2 After eight hours drying, apply a second coat of the same paint.

2.3 Painting should be carried out by brush only.

B. MAINTENANCE PAINTING (FOR OLD PAINTED JOINTS)

1. Surface preparation

1.1 Remove dust, dirt, and flaked paint from the welded joint by wire brushing.

1.2 Degrease the surface by petroleum hydrocarbon or any other suitable solvent, if oil or grease is present. Allow it to dry.

2. Painting Procedure

2.1 Apply one coat of ready mixed paint, brushing, bituminous black, lead free, acid, alkali and chlorine resistant to IS.9862-1981 or bituminous emulsion to IRS: P-30-1996 on welded area and 10 cm on either side.

2.2 If required, a second coat of the same paint may be applied after a minimum of eight hours drying.

2.3 Painting should be carried out by brush.

3. The list of approved manufacturers for the above quality of paints is issued every year by the Director General (M&C), RDSO, Lucknow to Zonal Railways.

ANNEXURE-7

PROCEDURE FOR PAINTING OF WELD COLLAR FOR THERMIT WELDED RAIL JOINTS TO PROTECT AGAINST SEVERE CORROSION

A. **NEW WELDED JOINT**

1. **Surface Preparation**

1.1 Remove dust, loose rust and mill scale by wire brushing.

1.2 Scrub welded area with water to make it free from slag and other water-soluble compounds. Make it dry.

2. **Painting Procedure**

2.1 Apply one coat of high build epoxy paint (two pack) conforming to RDSO specification No. M&C/PCN-111/88 on the welded area up to 10 cm on either side.

NOTE:

1. The epoxy-based paint recommended is a two-pad system with a pot life of around five hours. Hence, prepare only that much quantity of paint which can be consumed in less than five hours.

2. The paint should be procured along with the thinner recommended by the manufacturer of the paint. No other thinner i.e. kerosene oil, etc. should be used.

3. The painting shall be carried out by brush only. Brush shall be cleaned by the thinner after use.

4. The list of probable suppliers is given below as per RDSO's letter No. M&C/PCN/ II/TR/3 dt. 13/14-5-1991.

(i)	M/s Asian Paints (India) Ltd. 'Nirmal', 5th Floor, Nariman Point, P.B. No.1546, Mumbai-400421	(iii)	M/s Goodlass Nerolac Paints (P) Ltd., Nerolac House, Ganpat Rao Kadaw Marg, Lower Parel, Mumbai-400013
(ii)	M/s Addison Paints & Chemicals Ltd., 'Huzur Gardens' Sembium, Chennai-600011	(iv)	M/s Shalimar Paints Ltd. 13, Camac St., Kolkata - 700071
		(v)	M/s Berger Paints India Ltd. 32, Chowringhee Road, Kolkata

ANNEXURE-8

PROCEDURE FOR ULTRASONIC TESTING OF ALUMINO THERMIC RAIL JOINTS

1. This procedure covers the requirement of ultrasonic testing of Alumino Thermic (AT) welded rail joints immediately after execution of the weld.

2. **General Conditions of Test**

2.1 **Surface Preparation**

After execution of the AT weld, the welded zone shall be dressed properly to facilitate placement of probes and to avoid incidence of spurious signals on the CRT. The rail table shall be dressed to obtain reasonably flat and smooth surface. The flange and the web, up to a distance of 200 mm on either side of the weld collar shall be thoroughly cleaned with a wire brush to ensure freedom from dust, dirt, surface unevenness, etc.

2.2 **Couplant**

Water/soft grease shall be used as Couplant.

2.3 **Sensitivity**

The equipment sensitivity shall be set for normal, 70^0 and 80^0 probes in accordance with the procedure laid down in para 4. The sensitivity so adjusted shall be considered as normal gain setting and shall be utilised during AT weld testing. The sensitivity level shall not be altered during the course of testing.

3. **Apparatus Required**

3.1 **Equipment**

Any model of RDSO approved rail tester shall be considered suitable for testing of AT welded rail joints.

3.2 **Probes**

During ultrasonic examination of AT welded joints, the following probes shall be utilised:

(a) Normal (0^0), 4 MHz Double crystal fitted in trolley
(b) 70^0, 2 MHz, Double crystal fitted in trolley
(c) 80^0, 1.25 MHz Single crystal for hand probing.

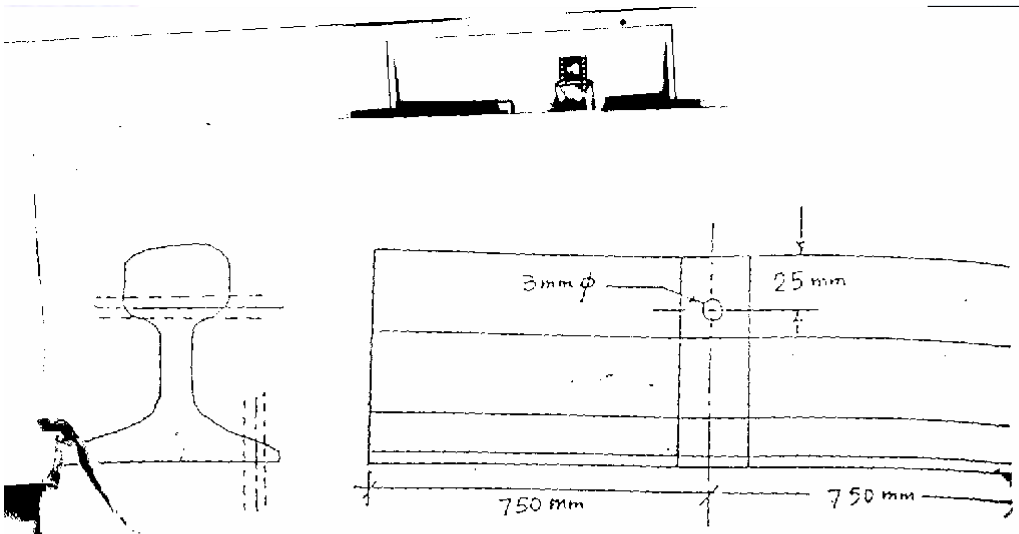


FIG-1

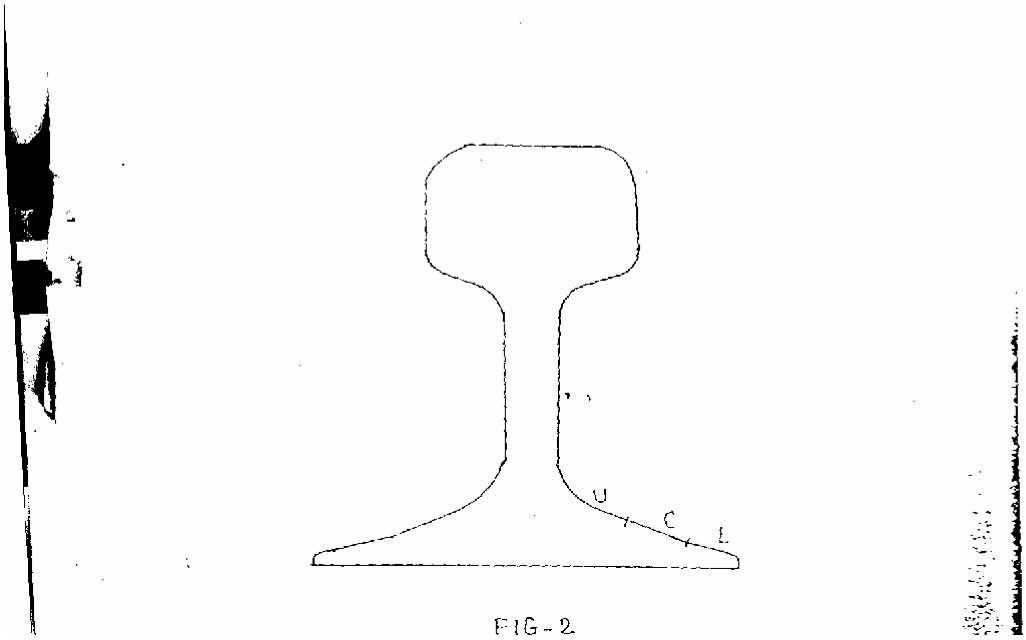


FIG-2

3.3 **Cable**

One co-axial cable of suitable length for connecting 80^0 probes to flaw detector shall be used. The length should not exceed more than 5m.

4. Sensitivity Setting Procedure

4.1 Calibration

The equipment shall be set for a depth range of 250 mm by manipulating the depth control knob suitably. Each main scale division, therefore, shall correspond to 25 mm.

4.2 Test Rail

The sensitivity of the ultrasonic equipment shall be set with the help of a standard AT welded rail piece of 1.5 m length having a simulated flaw at standard locations as shown in Fig.1.

4.3 Alignment of Probes

Alignment of normal and 70 ^{o} probes fitted with the trolley may be checked by placing the rail tester on the test rail using water/oil as a couplant and ensuring that the probes travel along the vertical axis of the rail.

4.4 Sensitivity setting for 70^{0} Probes

4.4.1 Place the trolley on the test rails shown in Fig.1. Keep the switches of all the probes in off positions and turn the potentiometer knobs of all the probes to 50% of their highest working range.

4.4. 2Switch on only 70^{0} towards probe and move the equipment towards the drilled hole of 3 mm dia in rail head. When the probe is just in the reflecting range, a pulse corresponding to the hole shall appear on the screen which during onward traveling shall show higher amplitude. The pulse shall appear moving from right to left. The equipment should be progressively moved forward till maximum height of the pulse is obtained. At this location the height of the pulse shall be adjusted to 50% of full screen height by suitably manipulation of the gain knob.

4.4.3 The forward probe shall be switched off and the 70% backward probe shall now be switched on. In this case a flaw signal shall appear moving from left to right. The signal height in this position shall also be adjusted to 60% of full screen height. This can be accomplished through suitable manipulation of relevant potentiometer.

4.4.4 The sensitivity setting for the normal problem has to be done while keeping all other probes in off position Switch on only the normal probe and bring if above 3 mm dia hole drilled in the head of the test rail. Manipulate the potentiometer control knob to obtain echo eight of 60% of full screen height at 1.0 division horizontal scale.

4.4.5 80^0 probe shall be connected to the socket available in the ultrasonic equipment. The selectors switch may be set to single crystal mode. Move the probe towards the3 mm dia hole drilled at the middle of the flange through in the AT weld and manipulate knobs to obtain a 60% full screen height on the CRT.

5. Criteria for Defect Classification

5.1 Any flaw signal obtained by normal probe of 40% height or more from head location shall be treated as a defective AT welded joint and any flaw signal obtained from the normal probe either from the web or the foot location shall also be a cause for rejection of the AT weld.

5.2 In the case of lack of fusion, inclusions, blow holes, etc. in the rail head, moving signal shall be obtained while testing with 70^0 probes. The position of onset of the signal and its corresponding range on the horizontal screen as well as their maximum amplitude shall be recorded.

A welded joint showing the moving signal of 40% or more of the full screen height shall be considered as a defective welded joint.

5.3 80^0 probes shall be placed on the flange at a distance of 180 mm corresponding to position 'L' in Fig.2 such that ultrasonic waves are directed towards the weld. The probe shall thereafter be moved slowly in zigzag patter towards the weld. A welded joint showing a flaw echo of 40% vertical height or more with the stipulated gain setting shall be treated as a defective welded joint. Similar testing shall be carried out of 'C' and 'U' regions as shown in Fig.2. In these cases, also the criteria for rejection shall remain the same.

6. The defective joints based on the criteria mentioned at para 5 shall not be allowed to remain in service and shall be cropped, re-welded and tested again. This execution shall be done by the contractor free of cost. The re-welded joints shall be scanned ultrasonically again with the same set of acceptance criteria to ensure freedom any harmful defects.

ANNEXURE – 9

EXTRACTS FROM IRS: T-19-1994 CLAUSE 4.2 ON MECHANICAL AND METALLURGICAL TESTS ON TEST WELDS AND RETESTS

4.2 **Mechanical and Metallurgical Tests on Test Welds**

4.2.1 Two new rail pieces of same section and grade, each approximately 750 long, shall be used to make test weld joint. The welded joint shall be made as per the technique offered by the manufacturer. The rail table and sides of rail head shall be finished to the geometrical tolerances specified in para 18.1

4.2.2 **Hardness Test:** Brinell hardness test shall be carried out at the welded zone, heat affected zones and parent metal of the rails in accordance with IS: 1500 "Method for Brinell hardness test for steel". The test shall be done on the top surface of the head of the test weld with a ball of 10 mm dia and a test load of 3000 kg maintained for 10 sec. The average hardness number (of two readings) determined for the weld metal at locations shown as 'A' in Fig. 1 given below shall be within +20 HB of the hardness values of rail as shown in table 1. The average hardness number (of two readings) on each heat affected zone at locations shown as 'B' and 'C' in Fig. 1 shall be within □+□ 20 HB actual hardness of the parent rail, except in case of head hardened rail. The average hardness of medium Manganese IRS-T-18 for welding is 230 HB.

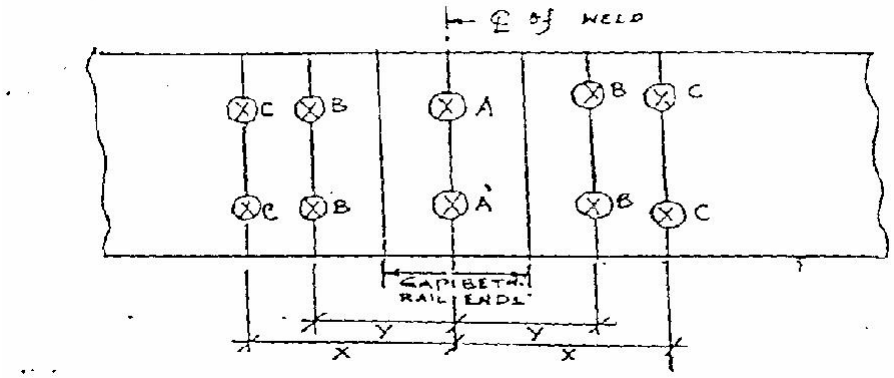


FIG.1

Note:

1. For 25 mm gap Skv welding X = 55 mm and Y = 45 mm

2. For wide gap (50 mm & 75 mm) welding

   X = Gap in mm + 42 mm and Y = Gap in mm + 32 mm 2

TABLE 1

Type of Rail	72 UTS Rail	90 UTS Rail	UIC Cr-Mn or Cr-V. Alloy Steel Rail	Head Hardened Rail
Average Hardness (BHN)	230	265	310	365

4.2.3 **Transverse Breaking Load Test**

4.2.3.1 The test weld shall be supported on cylindrical or semi-cylindrical supports having a distance of one metre between them from Centre to Centre. The weld shall be at the Centre of the span and loaded in such a manner that the foot of the rail is in tension. The diameter of mandrel and the supports shall be between 30 to 50 mm. The load shall be gradually increased (rate of loading shall not exceed 2.5 t/sec) till rupture occurs.

The test weld shall withstand a minimum load and show corresponding minimum defection as stipulated in Table 2 for different sections and types of rails.

TABLE 2

S. No.	Rail type	Rail Section	Min. transverse breaking load (t)	Min. deflection at the centre at the load in col.3 (mm)
	(1)	(2)	(3)	(4)
1.	72 UTS to IRS: T-12-1996	52 Kg.	85	18
	-do-	60 Kg.	95	18
2.	90 UTS to IRS: T-12-1996/860-0	52 Kg.	90	15
	or eqv.	60 Kg.	115	15

4.2.3.2 If the fracture does not occur through weld slice shall be cut transversely at the weld and etched boiling 1 : 1 hydrochloric acid for about 20 minutes determine casting defects if any.

4.2.3.3 The fractured surface of the weld, or in case while macro-etching is done on transverse section through joint, shall not show defects such as blow holes, porosity inclusions, etc. exceeding total permissible area of defects shown in Table 3. However, the size of any

individual defect shall not exceed 2 mm diameter. The defects should not exceed 2 mm diameter. The defects should not be interconnected and none of these shall extend upon the outer surface of the welded. There shall not be any lack of fusion. The fractured surface shall also not show the presence of accretions or mirror like structure and should be crystalline in acceptance.

TABLE 3

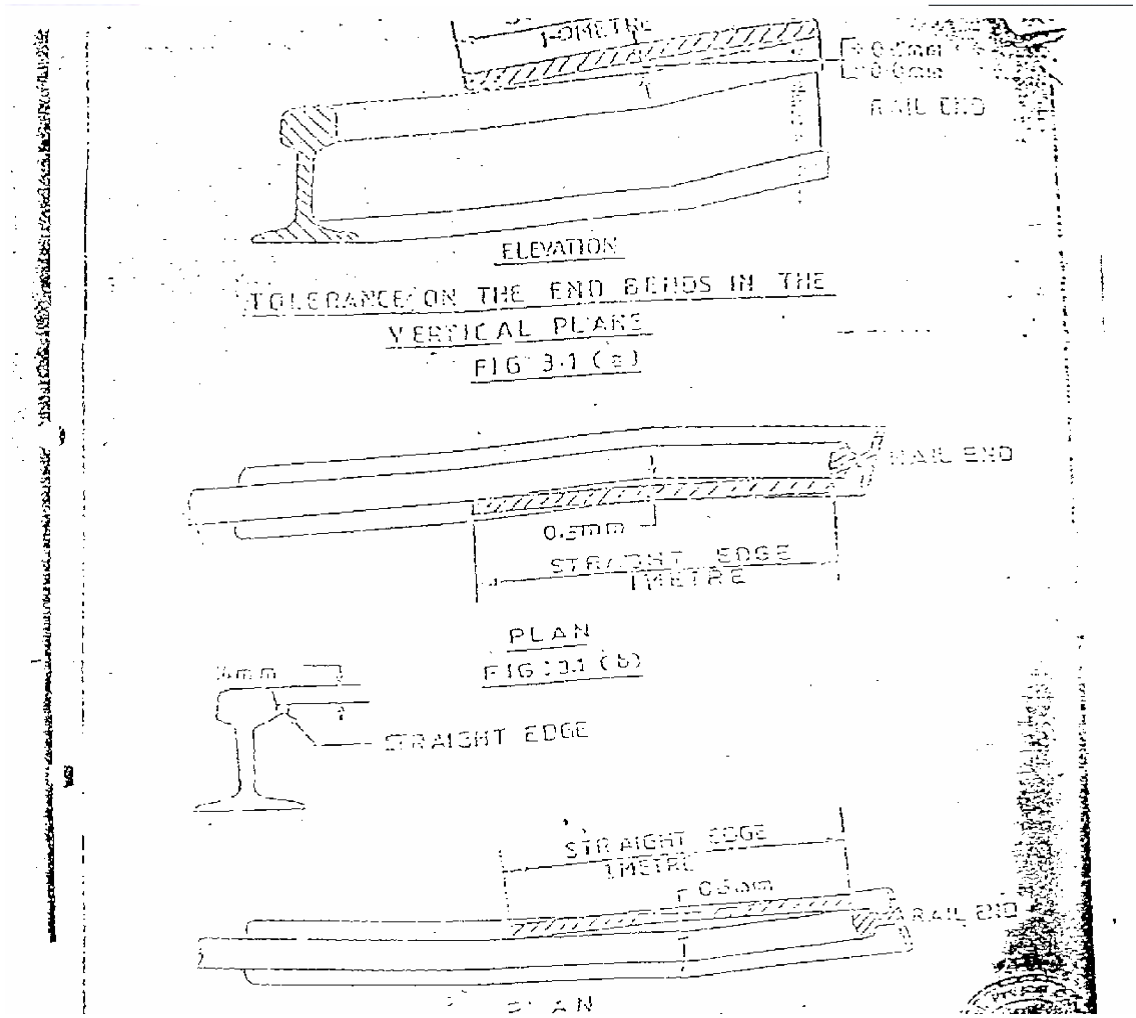
Area of permissible defects

Rail Section	Permissible total area of defect (mm)
52 Kg.	33.0
60 Kg.	38.4

4.3 **Re-tests**

4.3.1 If the results of any of the tests referred to in para 4.1 and 4.2 are found to be unsatisfactory, the batch will stand rejected. However, re-tests can be carried out at the manufacturer's request. These re-tests shall be carried out as para 4.1 and 4.2 on twice the original sample size.

4.3.2 If the results of all the re-tests samples are satisfactory, the batch represented by the sample portions shall be accepted. If any sample fails to meet the requirements of any of the tests, the batch shall be rejected.


1-0METRE
RAIL END
ELEVATION
TOLERANCE ON THE END BENDS IN THE VERTICAL PLANE
FIG 3·1 (a)
RAIL END
0.5mm
STRAIGHT EDGE
1METRE
PLAN
FIG 3·1 (b)
STRAIGHT EDGE
STRAIGHT EDGE
1METRE
RAIL END
PLAN

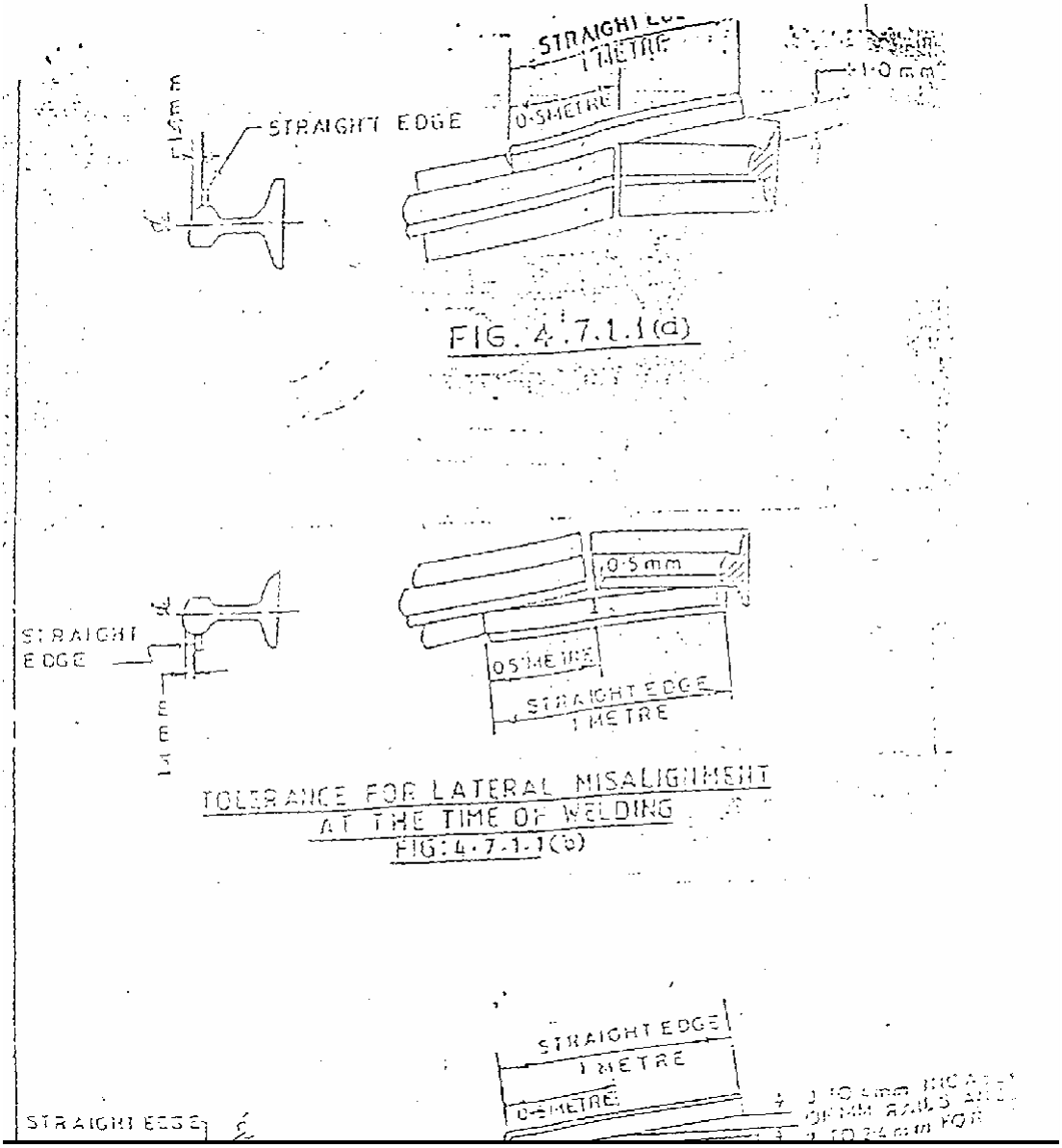
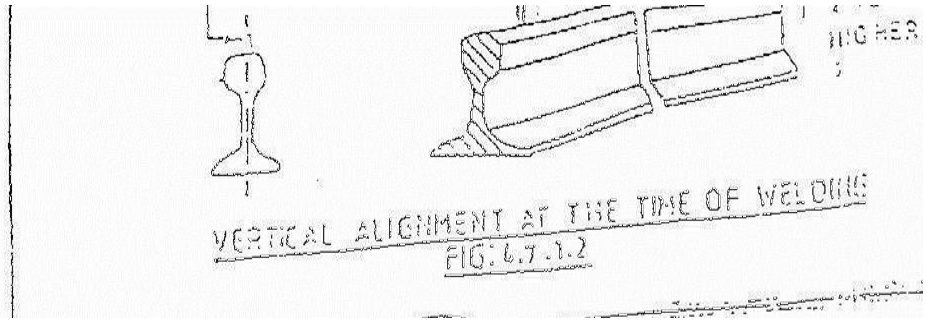
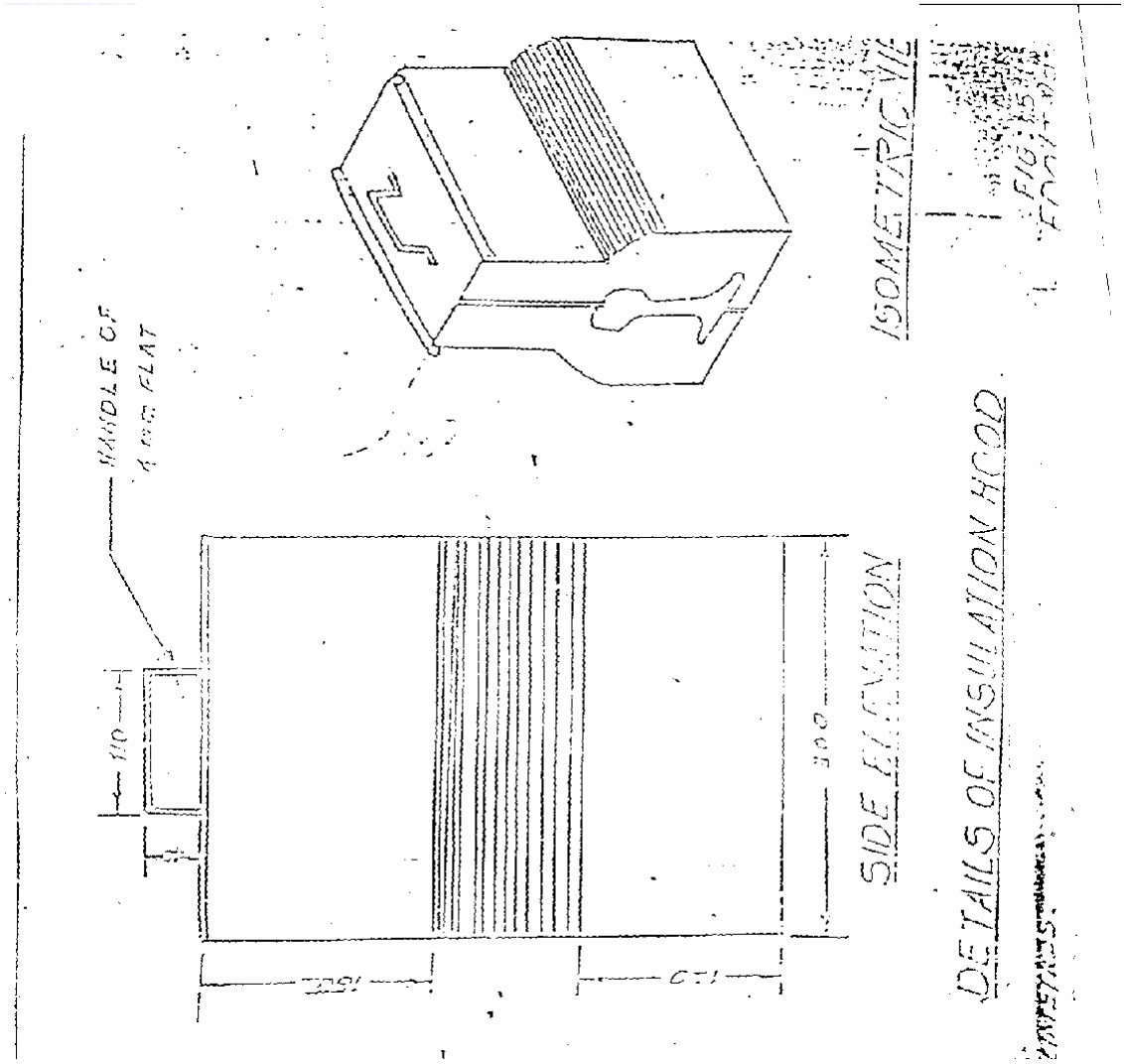


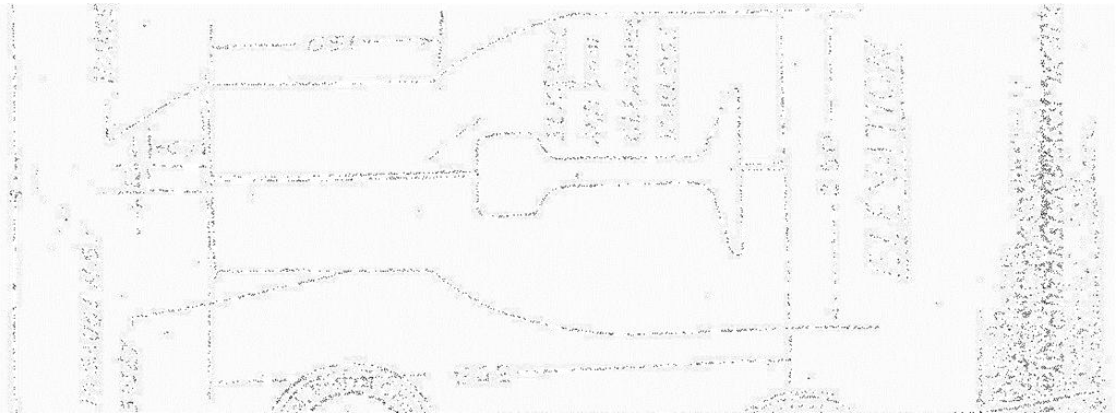
FIG. 4.7.1.1(a)

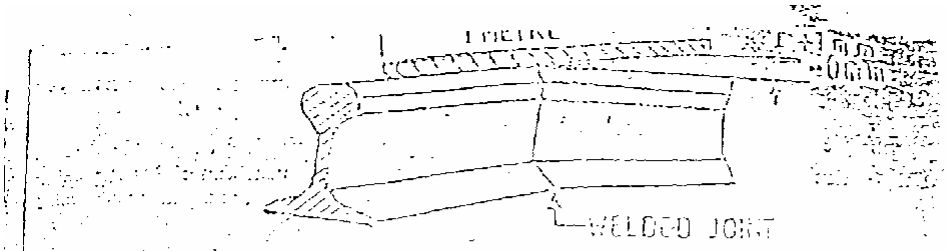
TOLERANCE FOR LATERAL MISALIGNMENT AT THE TIME OF WELDING
FIG: 4.7.1.1(b)



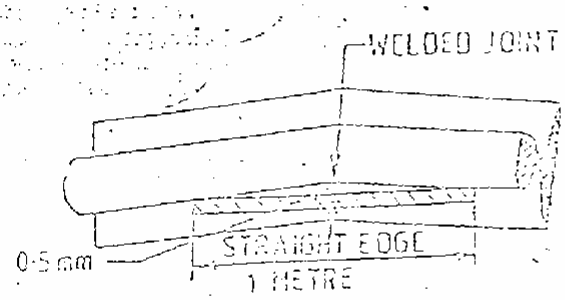
VERTICAL ALIGNMENT AT THE TIME OF WELDING
FIG. 4.7.1.2


ISOMETRIC VIEW
SIDE ELEVATION
DETAILS OF INSULATION HOOD

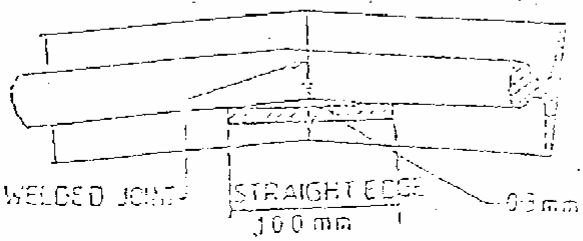




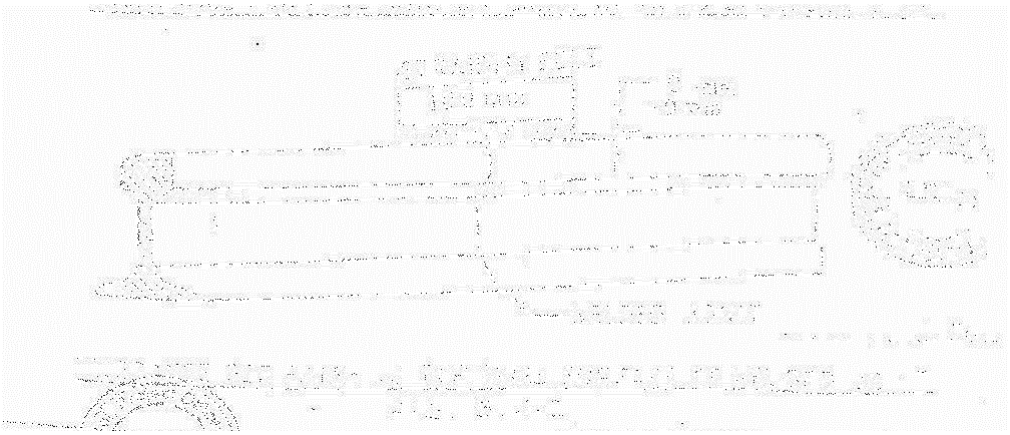
TOLERANCE FOR VERTICAL MISALIGNMENT OF WELDED JOINT



TOLERANCE FOR LATERAL MISALIGNMENT OF WELDED JOINT



TOLERANCE FOR SINUSOIDAL ON SIDES OF HEAD OF RAIL



SPECIFICATIONS FOR P.WAY WORKS

SPECIFICATIONS FOR P.WAY WORKS

1. All works - linking of Railway tracks, assembling, laying and linking of points and crossings, ballasting, through packing and connected works shall confirm to the various instructions and specifications stipulated in "Indian Railways Permanent Way Manual with upto date correction slips, IRS drawings, track manual and other relevant Railway Codes/Manuals.

2. The proposed sidings will be laid with 52 Kg S/H or IU Rails on PSC sleepers in SWR/single rails as the case may be.

3. The Turn-outs assembly i.e. switch assembly, lead portion and crossing assembly will be laid with 52/60 Kg Rails to the Indian Railway Standard on PSC sleepers with a ballast cushion as directed by Engineer in-charge or his authorized representative at site.

4. The operation of dumping ballast, lifting and packing should continue till such time the track attains final level and shape of ballast section.

5. Pack the sleeper with ballast as directed by Engineer in-charge or his authorized representative at site.

6. Lift the track to the required level as directed by Engineer in-charge or his authorized representative at site.

7. Rails shall be connected by means of pair of fish plate in the first instance only with two bolts and nuts, one in each rail. The fishing planes of the fish plates and rail are to be greased. Proper size of expansion liners are to be provided at the joints to ensure correct expansion gaps. Cutting of rails where necessary, will be done to suit squaring of joints.

8. On curves sharper than 5º (radius less than 350m) the rail joints will be mid-staggered or as directed by the Engineer-in-Charge.

9. All the drilled bolt holes are to be chamfered by chamfering tools.

10. Paint mark shall be made on the rails showing the spacing of sleepers as directed by Engineer-in-Charge at site.

11. Sleeper spacing:

a. Sleeper spacing for fish-plated joints having 13m/12m single rails:

Sleeper Spacing	**M+7 density**		**M+4 density**	
	13m	**12m**	**13m**	**12m**
(i) Rail ends to centre of sleeper	15cm	15cm	15cm	15cm
(ii) Centre of joint sleeper to centre of 1st shoulder sleeper	61cm	60cm	61cm	60cm
(iii) Centre of 1st shoulder sleeper to centre of 2nd shoulder sleeper	64cm	63cm	70cm	69cm
(iv) Centre of 2nd shoulder sleeper to centre of intermediate shoulder sleeper	68cm	66cm	84cm	83cm

b. Sleeper spacing for SWP of 3X13m/3X12m/3X 11mrails:

Sleeper Spacing	**M+7 density**		**M+4 density**		
	39m	**36m**	**39m**	**36m**	**33m**
(i) Rail ends to centre of sleeper	15cm	15cm	15cm	15cm	15cm
(ii) Centre of joint sleeper to centre of 1st shoulder sleeper	59cm	58cm	66cm	62cm	60cm
(iii) Centre of 1st shoulder sleeper to centre of 2nd shoulder sleeper	61cm	60cm	75cm	67.5cm	66cm
(iv) Centre of 2nd shoulder sleeper to centre of intermediate shoulder sleeper	66cm	65.5cm	78cm	77cm	77.5cm

c. Sleeper spacing for curve with Mid-staggered Joint:
Sleepers =18 nos. per single rail length.

Sleeper Spacing	**18 Sleepers per rail**	
	13m	**12m**
(i) Rail ends to centre of sleeper	15cm	15cm
(ii) Centre of joint sleeper to centre of 1st shoulder sleeper	65cm	65cm
(iii) Centre of 1st shoulder sleeper to centre of 2nd shoulder sleeper	75cm	70cm
(iv) Centre of 2nd shoulder sleeper to centre of intermediate shoulder sleeper	85cm	75cm

12. Full quantities of small fittings are to be fitted completely after slewing the track to correct alignment as directed by Engineer-in-Charge at Site.

13. The track so linked shall be aligned correctly to the alignment pegs given or as directed by Engineer till it takes correct position and the remaining two bolts to be fixed in fish plated joints.

14. During the above process, alignment, adjustment and squaring of sleepers, gauging, Cross level and longitudinal levels should be checked and rectified by doing packing as directed.

15. The operation of spreading of stone ballast, lifting and packing should continue till such time the track attains final level and shape.

16. Greasing of fish plates, fish bolts and nuts with lubricating oil and graphite grease to be done by cleaning fishing planes of rail ends with wire brush.

17. **Screening of Track** should be done as per Indian Railways Permanent Way Manual Para-238 and as per direction of Engineer- in- Charge. **For screening work, required wooden blocks & wedges are to be arranged by the contractors. No extra payment will be made for arranging wooden blocks.**

18. The works should be executed in a workman like manner to the satisfaction of the Engineer-in-Charge at site. The contractor will be primarily responsible for Safety of traffic that moves on opened up track, notwithstanding the presence of NHIDCL's representative at site.

19. Good quality track ballast as per specification and of approved quality will have to be supplied and stacked on 'Cess' of formation or at the toe of bank or at suitable places as directed by Engineer-in-Charge. Stacks will be measured jointly by the contractor and Engineer-in-Charge and entered in a register to be signed jointly by them.

20. Lifting and spreading of stone ballast includes all lead, lift, ascent, descent, crossing road/ railway, handling as required for packing tracks from the stacks measured and passed already including all labour, tools and plants for the operation and the same will be arranged by the contractor at his own cost. The payment for spreading will be made based on measurement of ballast supplied in stacks.

21. Pulling out of ballast on to the formation by ballast rakes and boxing is to be done as per specified profiles. Proper templates and log lines should be used. The width at the shoulder should be as directed by Engineer-in-Charge which will normally be not less than3.55 metre (11'-0") and not more than 3.66 metre (12'-0").

22. No ballast should be wasted on the slopes of banks or in cuttings or any places.

23. After the ballast is measured, the Contractor shall spread it on top of the blanketing surface/formation/in the track with standard profile. After spreading, the ballast profile should be consolidated.

24. The thickness of the finished ballast spread should be as specified by Engineer-in-Charge, and the layer should be dressed and boxed to proper profile and dimensions.

25. While spreading the ballast on the finished formation, care shall be taken that the formation/blanketing surfaces is not damaged. In no circumstances, vehicular carts/trucks shall be permitted to ply on the finished blanketing/ formation. In case some damage to the surface is done, the Contractor shall repair the damages at his own cost before spreading the ballast.

26. Through packing of railway track on any type and any density of sleepers which will consist of –

(i) Opening of the road,
(ii) Examination of rails, sleepers and fastenings,
(iii) Squaring of sleepers,
(iv) Slewing of track to correct alignment,
(v) Gauging,
(vi) Packing of sleepers including lifting &levelling,
(vii) Repacking of joint sleepers,
(viii) Boxing of ballast section & tidying.

27. The length of track to be opened out on any day must not be more than that can be efficiently tackled by the end of the day. Broken or missing fittings are to be replaced and loose ones tightened. Cross drains are to be provided at mid-section each rail except sharper curve track. On sharper curve track the cross drains are to be provided as per direction of Engineer in-charge.

28. Through packing of points and crossings 1 in 8.1/2 or diamond x-over will comprise opening out of ballast, squaring of sleepers, replacing or readjusting fittings to keep correct gauge clearances of check rail, wing rails, etc. including lifting or lowering as necessary and packing all the sleepers in the points and crossings efficiently and finishing all works with boxing and dressing of the shoulder ash ballast neatly. All bolts and nuts including crossing bolts, check rail bolts, slide chairs, tongue rails, heel block bolts etc. are to be properly oiled and greased also.

29. Picking up slacks will include lifting and packing of sleepers where necessary, attention to all fittings and fastenings, adjusting gauge, cross level and longitudinal level, cleaning of drain etc. as directed by the NHIDCL's representative at site at specified scattered locations. The work should be neatly finished with proper boxing.

30. Any sleeper which have shifted from correct spacing or gone out of square shall be moved back and square after loosening the fastenings. The fastenings shall be tightened again after squaring.

31. The track shall be slewed to correct alignment by sighting along the rail head of the base rail. It should be ensured that track does not get lifted in the process of slewing.

32. The track shall then be given a final packing. For this, sighting shall be done along the base rail and any dip or low joint are found, the same are to be attended for its correction by packing of sleepers. After the base rail is thus packed for two or three rails length, the cross level should be checked and the opposite rail lifted wherever necessary and sleepers under the rail seat packed.

33. The joint and shoulder sleepers shall be re-packed and cross level adjusted at the time of each through packing of sleepers.

34. Oiling and greasing of hand operated points will include adjusting the point Roding and fixing hand lever frame, where found necessary by means of spikes with the sleepers for smooth operation of the point and adjusting the opening between tongue rail and stock rail. For any bent tongue rail, if required, Jim-crowing may have to be done and the gap adjusted as required. Blacksmith and other staff for this work, as required, will be deputed by the Contractor at his cost. Oil & Grease to be supplied by the Contractor at his own cost.

35. Gauge

Will be with standard broad gauge on straight and curves upto 350 m radius and 5 mm slack on sharper curves with a Permissible variation with (+) or (-) 3 mm. But not exceeding 1 mm between consecutive sleepers

36. Alignment

Should be perfectly straight verified by sighting. On curves, the alignment should be correct of versine or as directed by the Engineer-in-Charge, who will pass the work.

(i) Straight on 10M chord = (+) or (-) 2mm;
(ii) Curves of radius 600M on 10M chord = (+) or (-) 5mm;
(iii) Curves of radius 600M on 20M chord = (+) or (-) 10mm.

37. Level

To be checked by level board and spirit level. Track should be free from sag and low joints. Permissible variation of Cross levels being (+) or (-) 3 mm. but not exceeding 1 mm between consecutive sleepers.

38. Joint out of square:

(i) On straight = (+) or (-) 10mm;

(ii) On curves = 1/2 pitch of fish bolt holes.

39. High Joint: Permissible upto 2mm.

40. Low Joint: Not permissible.

41. All the elastic rail clips should be thoroughly cleaned. Grease to IS: 400-1981 (Specifications for Grease No. 'O' Graphite) should then be applied on Central leg of the E.R.C. and eye of Inserts and then the clip should be driven at the time of assembly. The rate accepted includes the cost of the grease as per specifications and labour.

42. During execution of the work, contractor should arrange for protection of track and displaying the signals as per extent rule of Indian Railways.

All the P. Way tools such as (a) Rail tongs, (b) Crow bars, (c) Fishing spanners, (d) Hammers, (e) Keying hammers, (f) Cotter splitters, (g) Shovels, (h) Mortar Pans, (i) Beaters, (j) Track Lifting Jacks, (k) Gauges, (l) Level Board, (m) Spirit levels, (n) Cant Board, (o) Expansion Liners, (p) Wooden Squares, (q) Steel Tape(r) Wire brushes, (s) Cotton waster, (t) Rake Ballast, (u) Chamfering tools, (v) Soap as required for the work as assessed by the Engineer- in-Charge depending on the labour strength will be arranged by the contractor at his own cost.

QUALITY ASSURANCE PLAN (QAP)

Table 0.1: Quality Control/Quality Assurance Plan for Earth Work - Sample Format

Quality Control/Quality Assurance Plan for Earth Work			**Project Name:**		**Prepared By:**		**Approved By:**		**Issue No.:** **Date:**		**Revision No.:** **Date:**
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
INCOMING STAGE											
1.1	Borrow Material	Grain size analysis (wet analysis)	1 test per source	IS 2720: Part 4	Type of soils normally avoided are: a) Organic clays, organic silts, peat, chalks, dispersive soils, poorly graded gravel and sand with uniformity coefficient less than 2. b) Clays and silts of high plasticity (CH & MH) in top 3m of embankment.	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/ Site Lab	It could be either Weekly / Fortnightly / Monthly or at Random
1.2		Atterberg limits	1 test per source	IS 2720: Part 5		Cassagrande's apparatus	QA staff/field	Format No.	Designated Site Executive	Approved/ Site Lab	Do
1.3		Soil Classification	-	IS 1498		-	-	Format No.	Designated Site Executive	Approved/ Site Lab	Do
1.4		Proctor Density (OMC & MDD)	1 test per source	IS 2720: Part 8		Proctor moulds, compaction equipment etc.	QA staff/field	Format No.	Designated Site Executive	Approved/ Site Lab	Do
2.1	Back filling in approaches of the bridges	Grain size analysis (wet analysis)	1 test per source	IS 2720: Part 4	Soil shall come under group of GW, GP or SW as per IS soil classification system.	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/ Site Lab	Do
2.2		Atterberg limits	1 test per source	IS 2720: Part 5		Cassagrande's apparatus	QA staff/field	Format No.	Designated Site Executive	Approved/ Site Lab	Do
2.3		Soil Classification	-	IS 1498		-	-	Format No.	Designated Site Executive	-	Do
IN PROCESS STAGE											
1.1	Borrow Material	Grain size analysis (wet analysis)	Minimum one test for every 5000 m3 or change of strata wherever is earlier.	IS 2720: Part 4	Type of soils normally avoided are: a) Organic clays, organic silts, peat, chalks, dispersive soils, poorly graded gravel and sand	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.2		Atterberg limits		IS 2720: Part 5		Cassagrande's apparatus	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.3		Soil		IS 1498		-	-	Format	Designated	Site	Do

Quality Control/Quality Assurance Plan for Earth Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		Classification			with uniformity coefficient less than 2. b) Clays and silts of high plasticity (CH & MH) in top 3m of embankment.			No.	Site Executive		
1.4		Proctor Density (OMC & MDD)		IS 2720: Part 8		Proctor moulds, compaction equipment etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.1	Back filling in approaches of the bridges	Grain size analysis (wet analysis)	Minimum one test for every 500 m3	IS 2720: Part 4	Soil shall come under group of GW, GP or SW as per IS soil classification system.	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.2		Atterberg limits		IS 2720: Part 5		Cassagrande's apparatus	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.3		Soil Classification		IS 1498		-	QA staff/field	Format No.	Designated Site Executive	Site	Do
FINAL STAGE											
1.1	Compacted earth & Blanket layer	Field Dry Density	a) Min one test in each compacted layer for every 200 m2 in top 1m of sub-grade. b) Min one test in each compacted layer for every 500 m2 in top 1m of sub-grade. c) Min one test in each compacted layer of blanket for every 200 m2.	IS 2720: Part 28 IS 2720: Part 29	Degree of compaction should be > 98% of lab MDD as per heavy compaction or as decided from field compaction trial or 70% of density index for soils having fines <5%.	Core cutter, Sand replacement apparatus, Nuclear Moisture-Density Gauge.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.2	Finished top level of sub-grade	Levels	As required	-	Variation should not be more than + or -25 mm from design level	By auto level or Total station	QA staff/field	Level Book	Designated Site Executive	Site	Do
	Finished top level of sub-grade	Levels	As required	-	Variation should not be more than + or -25 mm from design level	By auto level or Total station	QA staff/field	Level Book	Designated Site Executive	Site	Do

Table 0.2: Quality Control/Quality Assurance Plan for Concrete Work - Sample Format

Quality Control/Quality Assurance Plan for Concrete Work			**Project Name:**		**Prepared By:**		**Approved By:**		**Issue No.:** **Date:**		**Revision No.:** **Date:**
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
INCOMING STAGE											
1.1	Coarse Aggregate	Gradation	1 test per source	IS: 2386 P-1	As per IS 383	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	It could be either Weekly / Fortnightly / Monthly or at Random
1.2		Aggregate Impact value test.	1 test per source	IS: 2386 P-4	Max 30%	AIV machine, sieve balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
1.3		Flakiness Index	1 test per source	IS: 2386 P-1	Max 40%	Flakiness gauge, set of IS sieve, balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
1.4		Soundness Test	1 test per source	IS: 2386 P-5	Max 12% NaSo4 Max 18% MgSo4	Set of IS sieve, chemical & balance etc.	QA staff/field	-	Designated Site Executive	Approved Lab	Do
1.5		Specific Gravity	1 test per source	IS: 2386 P-1	-	Wire busket, balance, Hot air Oven etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
1.6		Water Absorption	1 test per source	IS: 2386 P-3	Max 1%	Porcelin dish, oven balance etc	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
1.7		Alkali Aggregate Reactivity Test	1 test per source	IS: 2386 P-7	As per SP	-	QA staff/field	-	Designated Site Executive	Approved Lab	Do

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
1.8		Deleterious Material	1 test per source	IS: 2386 P-2	IS: 383	-	QA staff/field	-	Designated Site Executive	Approved Lab	Do
2.1	Fine Aggregate	Gradation	1 test per source	IS: 2386 P-2	As per IS 383	Set of IS sieves Balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
2.2		Water absorption	1 test per source	IS: 2386 P-3	Max 2%	Porcelin dish, oven balance etc.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
2.3		Soundness	1 test per source	IS: 2386 P-3	Max 10% NaSo4 Max 15% MgSo4	-	QA staff/field	-	Designated Site Executive	Approved Lab	Do
2.4		Specific Gravity	1 test per source	IS: 2386 P-3	-	Specific Gravity bottle or pycknometer.	QA staff/field	Format No.	Designated Site Executive	Approved/Site Lab	Do
2.5		Deleterious Material	1 test per source	IS: 2386 P-2	IS:383	-	QA staff/field	-	Designated Site Executive	Approved Lab	Do
3.1	Cement	Physical Inspection (Manufacturing Week No., Month, Quantity, Quality etc.)	1 test per each brand & type of cement and for each design mix.	IS: 8112-89	Good Condition	Visual	QA staff/field	-	Designated Site Executive	Manufacturers test certificate shall be obtained. Samples shall be sent to approved lab for testing.	Record from concerned Section will be verified every quarter
3.2		Standard Consistency		IS: 4031 Part 4	As per type of cement	Vicat Apparatus	QA staff/field	Format No.	Designated Site Executive	Approved Lab	Record from concerned Section will be verified every quarter.
3.3		Initial & Final		IS: 4031 Part 5	As per type of	Vicat Apparatus	QA	Format No.	Designated	Approved Lab	Record from

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		Setting time			cement		staff/field		Site Executive		concerned Section will be verified every quarter.
3.4		Soundness Test		IS: 4031 Part 3	As per type of cement	Le-chatelie Apparatus	QA staff/field	Format No.	Designated Site Executive	Approved Lab	Record from concerned Section will be verified every quarter.
3.5		Compressive Strength of Cement Mortar Cubes.		IS: 4031 Part 6	As per grade of concrete	Vibrating Table, moulds, testing machine etc.	QA staff/field	Format No.	Designated Site Executive	Approved Lab	Record from concerned Section will be verified every quarter.
4	Steel	Physical & Chemical properties	1 test per each type of steel	As per Grade of Steel	IS: 1786, IS: 432	-	QA staff/field	-	Designated Site Executive	Manufacturers test certificate shall be obtained.	If applicable quarterly lab result will be verified.
5	Water	Test for suitability	1 test per source	IS: 3025	As per IS 456:2000	Water testing kit	QA staff/field	-	Designated Site Executive	Samples shall be sent to approved lab once for each source.	Once per source
6	Admixture	Test for suitability	1 test per source	IS: 9103	As per IS 456:2000	-	QA staff/field	-	Designated Site Executive	Approved Lab, Manufacturers test certificate shall be obtained.	Record from concerned Section will be verified every quarter.
IN PROCESS STAGE											
1.1	Coarse Aggregate	Gradation	1 test per 500 cu. M of aggregate	IS: 2386 P-1	As per IS 383	Set of IS sieves, Balance etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	It could be either Weekly / Fortnightly /

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
											Monthly or at Random
1.2		Aggregate Impact value test.	1 test per month	IS: 2386 P-4	Max 30%	AIV machine, sieve balance etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.3		Flakiness Index	1 test per month	IS: 2386 P-1	Max 40%	Flakiness gauge, set of IS sieve etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.4		Specific Gravity	1 test per mix design	IS: 2386 P-1	-	Wire busket, balance, Hot air Oven etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
1.5		Water Absorption	1 test per month	IS: 2386 P-3	Max 1%	Porcelin dish, oven balance etc	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.1	Fine Aggregate	Gradation	1 test per source	IS: 2386 P-2	As per IS 383	Set of IS sieves Balance etc.	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.2		Water absorption	1 test per month	IS: 2386 P-3	Max 2%	Porcelin dish, oven balance etc	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.3		Specific Gravity	1 test per mix design	IS: 2386 P-3	-	Specific Gravity bottle or pycknometer	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
2.4		Silt content of sand	1 test per 15 days	IS: 2386 P-3	Max 6%	1000 ml jars etc	QA staff/field	Format No.	Designated Site Executive	Site Lab	Do
3.1	Cement	Physical Inspection (Manufacturing Week No.,	While concreting & once in a month for each brand and type of cement	IS: 8112-89	Good Condition	Visual	QA staff/field	-	Designated Site Executive	Site Lab	Do

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		Month, Quantity, Quality etc).									
3.2		Initial & Final Setting time	Once in a month for each brand & type of cement	IS: 4031 Part 5	As per type of cement	Vicat Apparatus	QA staff/field	Format No.	Designated Site Executive	Site Lab	Record from concerned Section will be verified every quarter.
4.1	Steel	Physical & Chemical properties	1 test per 500 MT of steel	As per Grade of Steel	As per IS 456:2000	-	QA staff/field	-	Designated Site Executive	Samples shall be sent to approved lab for testing	If applicable quarterly lab result will be verified.
4.2		Anti-corrosive treatment	Compulsory for all the steel.	CECRI method	Visual Observation	Acid, Alkaline powder, water, inhibitor cement slurry, sealing solution.	QA staff/field	Check list before concreting	Designated Site Executive	Site	If applicable quarterly lab result will be verified.
5	Water	Test for suitability	At the discretion of site In-charge.	IS: 3025	As per IS 456:2000	Water testing kit	QA staff/field	-	Designated Site Executive	Approved lab/Simple tests can be checked at site lab as required.	Once per source
6	Admixture	Test for suitability	Each batch shall be checked for manufacturing & Expiry date once in 3 months.	IS: 9103	As per IS 456:2000	-	QA staff/field	-	Designated Site Executive	Samples shall be sent to approved lab.	Record from concerned Section will be verified every quarter.
7.1	Concrete	Slump Test	As required at the discretion of site-in-charge.	IS: 1199	As per IS 456:2000	Slump cone apparatus	QA staff/field	Format No.	Designated Site Executive	Site Lab	Random
7.2		Temperature of	As required at the	-	As per IS 456:2000	Thermometer	QA	-	Designated	Site Lab	Random

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		Concrete	discretion of site-in-charge.				staff/field		Site Executive		
7.3		Compressive strength test on cubes	1-50 m3 = 6 cubes (3 for 7 days & 3 for 28 days) For each additional 50 m3 6 cubes added. For ez: 1-50 m3-6 No., 51-100 m3 – 12 No., 101-150 m3-24 No. (As specified in contract agreement)	IS: 516	As per IS 456:2000	Compressive testing machine etc	QA staff/field	Format No.	Designated Site Executive	Site Lab	Record from concerned Section will be verified every quarter
7.4		Permeability test	Once for each design mix and one test per 3 months for each grade of concrete.	IS: 3085	Max 25 mm	Permeability test apparatus	QA staff/field	-	Designated Site Executive	Approved/Site Lab	Record from concerned Section will be verified every quarter
FINAL STAGE											
1.1	Pile	Initial vertical compression load test on piles	As per agreement	IS: 2911 (Part 4)	Max settlement: 12 mm	Jack, Proving ring, dial gauges, reaction girder etc.	QA staff/field	Test data & results should be recorded.	Designated Site Executive	Site Lab	Record from concerned Section will be verified every quarter.
1.2		Routine load test on piles	As per agreement	IS: 2911 (Part 4)	Max settlement: 12 mm	Jack, Proving ring, dial gauges, reaction girder etc.	QA staff/field	Test data & results should be recorded.	Designated Site Executive	Site Lab	Record from concerned Section will be verified every quarter.
1.3		Control of	At regular interval &	IS: 2911 (Part	Pile should not be	Distomat & levelling	QA	Register	Designated	Site	Record from

Quality Control/Quality Assurance Plan for Concrete Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Test Conducted**	**Frequency (Min)**	**Ref Standard for Test Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Responsibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		alignment of piles	as required	1- section 2)	shifted more than 100 mm from their designed position.	equipment	staff/field		Site Executive		concerned Section will be verified every quarter.

Table 0.3: Quality Control/Quality Assurance Plan for Track Work - Sample Format

Quality Control/Quality Assurance Plan for Track Work			**Project Name:**		**Prepared By:**		**Approved By:**		**Issue No.:** **Date:**		**Revision No.:** **Date:**
S.N.	**Material Activity**	**Sampling**	**Type of Inspection & Test**	**Ref to Standard Quality Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Respons ibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
INCOMING STAGE											
1.1	Stone Ballast	First 100 cum thereafter for 2000 Cum	Impact value, Abrasion value, Water absorption test.	As per RDSO Specification	Impact Value = 20% Max. Abrasion Value = 30% Max. Water Absorption = 1% Max.	Impact Value testing equip. Abrasion Value testing equip. Water absorption testing equip.	QA staff/field	Test Report File	Designated Site Executive	-	-
1.2		One out of every stack, 100 cum or part thereof.	Sieve Analysis	As per RDSO Specification	a) Retained on 65mm sq mesh sieve 5% (Max). b) Retained on 40mm sq mesh sieve 40-60%. c) Retained on 20mm sq mesh sieve not less than 98% for machine crushed.	Sieve, Measuring Tape, Levelling Staff, Measuring Box, Weighing Machine.	QA staff/field	Ballast Measuring Register	Designated Site Executive	-	-
2	Mould, portion for AT welding of rail joints.	100%	Batch No., Date of manufacture, Date of Expire	Manual for AT welding	Manual for AT welding	Visual Inspection	QA staff/field	Welding Register	Designated Site Executive	-	-
3	Special PSC sleeper	As per RDSO Specification	Load Test, Visual Inspection etc.	As per RDSO Specification	As certified by RDSO	Authorised Lab/RDSO	Supply Agency	Inspection Certificate	Store In-charge	-	-
4	Elastic Rail Clips	As per IRS T-31-92	Load Test, Visual Inspection etc	As per IRS T-31-92	As certified by RDSO	Authorised Lab/RDSO	Supply Agency	Test Report File	Store In-charge	-	-
5	Grooved Rubber Sole Plate	As per IRS T-47-2000	Load Test Visual Inspection etc	As per IRS T-47-2000	As certified by RDSO	Authorised Lab/RDSO	Supply Agency	Test Report File	Store In-charge	-	-
6	GFN Liner	As per IRS T-44-	Load Test, Visual	As per IRS T-	As certified by RDSO	Authorised	Supply	Test Report	Store In-	-	-

Quality Control/Quality Assurance Plan for Track Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Sampling**	**Type of Inspection & Test**	**Ref to Standard Quality Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Respons ibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
		2000	Inspection etc	44-2000		Lab/RDSO	Agency	File	charge		
7	Fish Plates with Bolts & Nuts	As per IRS T1-66	Load Test, Chemical Test etc	As per IRS T1-66	As certified by RDSO	Authorised Lab/RDSO	Supply Agency	Test Report File	Store In-charge	-	-
8	CMS crossing for 1 in 8.5 turn out	As per IRS T-29-2000	Load Test, Dimensional check, chemical test etc.	As per IRS T-29-2000	As certified by RDSO	Authorised Lab/RDSO	Supply Agency	Test Report File	Store In-charge	-	-
IN PROCESS STAGE											
1.1	Stone Ballast	One out of every 2000 Cum	Impact value, Abrasion value, Water absorption test.	As per RDSO Specification	Impact Value = 20% Max. Abrasion Value = 30% Max. Water Absorption = 1% Max.	Impact Value testing equip. Abrasion Value testing equip. Water absorption testing equip.	QA staff/field	Test Report File	Designated Site Executive	-	-
1.2		One out of every stack, 100 cum or part thereof.	Sieve Analysis	As per RDSO Specification	a) Retained on 65mm sq mesh sieve 5% (Max). b) Retained on 40mm sq mesh sieve 40-60%. c) Retained on 20mm sq mesh sieve not less than 98% for machine crushed.	Sieve, Measuring Tape, Levelling Staff, Measuring Box, Weighing Machine.	QA staff/field	Ballast Measuring Register	Designated Site Executive	-	-
2	AT welding of rail joints.	100%	Horizontal & Vertical Alignment	Manual for AT welding	Manual for AT welding	Straight edge – 1m & 10cm	QA staff/field	Welding Register	Designated Site Executive	-	-
3	Fish Butt welding of rail joints	100%	Horizontal & Vertical Alignment	Manual for FB welding	Manual for FB welding	Straight edge – 1m & 10cm	QA staff/field	Welding Register	Designated Site Executive	-	-
4	Track Linking	100%	Track Gauge, Versine, Level, SE etc.	As per Railway Safety & P. Way Manual	As per contract specification	Scale, string, gauge cum level	QA staff/field	Site Record	Designated Site Executive	-	-

Quality Control/Quality Assurance Plan for Track Work			Project Name:		Prepared By:		Approved By:		Issue No.: Date:		Revision No.: Date:
S.N.	**Material Activity**	**Sampling**	**Type of Inspection & Test**	**Ref to Standard Quality Procedure**	**Specification Limit for Acceptance**	**Inspection Measuring & Test Equipment**	**Respons ibility**	**Record to be Maintained**	**Verification by Activity In-charge**	**Remarks**	**Frequency of Test by QA**
FINAL STAGE											
1	Stone Ballast	Every Stack	Shape, size & making of stack	As per RDSO Specification	As per RDSO Specification	String, Measuring tape	QA staff/field	Ballast Measuring Register	Designated Site Executive	-	-
2.1	AT welding of rail joints	1 in 100 joints	Hardness, Transverse Load	As per IRS T-19-1994	As per Manual of AT Welding	Authorised Lab	QA staff/field	Test Report File	Designated Site Executive	-	-
2.2		100%	USFD Test	USFD Manual	USFD Manual	USFD Testing Machine	RDSO certified personnel	Test Report	Designated Site Executive	-	-
3.1	Fish Butt welding of rail joints	1 in 100 joints for first 1000 joints and subsequently 1 in 500 joints	Hardness, Transverse Load	As per IRS T-19-1994	As per Manual for FB welding	Authorised Lab	QA staff/field	Test Report	Designated Site Executive	-	-
3.2		100%	USFD Test	USFD Manual	USFD Manual	USFD Testing Machine	RDSO certified personnel	Test Report	Designated Site Executive	-	-
4	Railway Track	100%	CRS Inspection	As per I. Railway Safety & P. Way manual	As per contract Specification	Trolley/Foot	QA staff/field	Inspection Report	CRS/PH	-	-

Section -9

DRAWINGS

LIST OF DRAWINGS

S. No.	Name of Drawings
01	Lay Out Plan
02	L-Section of Alignment
03	GAD of Bridges
04	Typical Profile of Filling & Cutting

Drawings for the Work: The Drawing for the work can be seen in the office of the General Manager - Technical/NHIDCL/New Delhi or RO/NHIDCL/Guwahati at any time during the office hours. The drawings are only for the guidance of Tenderer(s). Detailed working drawings (if required) based generally on the drawing mentioned above, will be given by the Engineer or his representative from time to time.

Section–10

GENERAL CONDITIONS OF CONTRACT

GENERAL CONDITIONS OF CONTRACT

"INDIAN RAILWAY GENERAL CONDITIONS OF CONTRACT FOR WORKS, 2019" is attached in the form of a Booklet & can also be down loaded from IR web site. GCC has to be signed by the contractor and the accepting authority of the tender for making of agreement of the contract.

Development of Multimodal Logistics Park at Jogighopa and External Trunk Connectivity Infrastructure to the Multimodal Logistics Park (MMLP) site at Jogighopa

"Earthwork in Formation, Road Work, Construction of Bridges, Blanketing, P. Way Linking works including Supply of P. Way Fittings and Track Ballast in connection with Construction of Railway Siding from Jogighopa Railway Station to MMLP at Jogighopa, Distt - Bongaigaon, Assam from Ch. 00 to 3760 - Package III of MMLP"

PART – 2

FINANCIAL BID

National Highways & Infrastructure Development Corporation Limited,
(A Govt. of India Undertaking)
3rd Floor, PTI Building, 4 Parliament Street,
New Delhi – 110001

Section–11

BILL OF QUANTITIES

SUMMARY

Schedule	Quoted Price (Rs. in figures)	Quoted Price (Rs. in words)
Schedule 1: (Supply of P. Way Materials)		
Schedule 2: (Supply of Ballast)		
Schedule 3: (P. Way Linking)		
Schedule 4: (Earth Work)		
Schedule 5: (Bridge Work)		
Schedule 6: (Road Work)		
TOTAL (Schedule 1 to 6)		
REBATE		
TOTAL PRICE (after rebate adjustment)		

Schedule – 1 (Supply of P. Way Materials)

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
1	Supply of Rails 52Kg IU/SH conforming to IRS-T/12	MT	592.8		
2	Supply of PSC Sleeper to RDSO Drg No. T-3178 & T-4170 to 4173 for curves as per site requirement	Nos.	8778		
3	Supply of Grooved Rubber Sole Plate to RDSO Drg. No. T-3703 (upto date Alteration) conforming to IRS Specification for 6 mm thick grooved rubber sole plates (Provisional) 1987 revised 2000	Nos.	17556		
4	Supply of Elastic Rail clips with flat toe (MK.III) to RDSO Drg. No. T-3701 (Alt.3) conforming to specifications IRS-T-31/1989.	Nos.	31604		
5	Supply of Elastic rail clips type 'J' for use at fish-plated joints as per RDSO Drg. No. T-4158 conforming to IRS Specification.	Each	3508		
6	Supply of Metal liners to RDSO Drg. No. T-3738 (upto date Alteration) conforming to IRS specification	Each	35112		
7	Supply of Fish Plates 52 kg to RDSO Drg. No. T- 090 (M) with upto date alteration conforming to IRS Specification No. T- 1	Each	585		
8	Fish Bolts and nuts as per RDSO Drg. No. T-1899 Alt-2 of size 25 mm dia and140 mm long conforming to IRS Specification No. T-23/67.	Each	3508		
9	Supply of 60kg 1 in 12, 10125 mm curved switches Turnout confirming to RDSO Drg. No. T-4218 with latest alterations, if any complete with PSC sleepers including approach & long sleepers), Lead Rails, CMS crossing Check Rails & all fittings complete as per drawing.	Each	2		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
10	Supply of 52kg 1 in 8.5, 6400 mm curved switches Turnout confirming to RDSO Drg. No. T-4865 with latest alterations, if any complete with PSC sleepers including approach & long sleepers), Lead Rails, CMS crossing Check Rails, Stretcher Bars, Spring Lever & all fittings complete as per drawing.	Each	4		
11	Supply of Derailing Switch 52kg 1 in 8.5, 6400 mm curved switches confirming to RDSO Drg. No. T-4866 with latest alterations, if any complete with PSC sleepers including approach & long sleepers), Stretcher Bars & all fittings complete as per drawing.	Each	1		
13	Supply of PSC Sleeper for LC to RDSO Drg. No. RDSO/T-4148-A	Each	16		
14	CI bracket as per RDSO Drg. No. T-4917 conforming to IS: 210-1962 (grade 20) & IRS T-10	Each	32		
15	L-Bracket as per RDSO Drg. No. T- 4784 conforming to IS: 210-1962 (grade 20) & IRS T-10	Each	32		
16	Bolts & Nuts (25mmX110mm) including single coil spring washer as per RDSO Drg. No. T-11506, IRS T-10	Each	32		
17	Double Coil Spring washer conforming to RDSO Drg. No EDO/T-1214	Each	32		
18	Single Coil Spring washer as per RDSO Drg. No. T-10773 conforming to IRS-T-42-1988	Each	32		
19	Plate Screw as per RDSO Drg. No. T- 3913 conforming to IRS T-16	Each	64		
				TOTAL	

Note; -

Before procurement latest RDSO drawing Number & quantity to be confirmed as per site requirement. Payment shall be made only for the quantity laid in Track. Surplus quantity may be accepted for future Track maintenance.

Schedule–2 (Supply of Ballast)

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
1	Supply & delivery of Locally available Machine crushed Ballast of 50 mm size clean angular, hard and durable track ballast as per specification and stacking the same on cess of the formation or toe of the bank or at suitable place as directed by Engineer- in-Charge at site. The rate includes all cost of lead, lift, royalty, sales tax & other tax and duties and all incidental charges complete as applicable. Tools, plants and screens of approved mesh & dimensions required for inspection and passing at the time of measurement are to be arranged by the contractor. The rate also includes levelling of ground, if necessary, where the ballast is to be stacked & spreading on formation. **Note:** 90% payment shall be released on the net quantity accepted and balance 10% shall be released after spreading.	Cum	7410		
2	Leading and Spreading of ballast with all lead & lift on track/formation to ensure uniform and compact ballast cushion under the sleepers. The rate is inclusive of maintaining specified line and approved profile as per specification. Spreading of ballast on track/formation will be done only after supply is completed for a particular stretch as decided by Engineer-in-Charge and ballast stacks have been released for spreading.	Cum	7410		
				TOTAL	

Schedule–3 (Track Linking)

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
1	Dismantling of existing BG track, turnouts, derailing switches, dead ends, sand humps, etc. of any rail section and any type of sleepers of any density and transporting all released material including sleepers, rails, switches, crossings and fittings & fastenings to the nearest station or manned level crossing or road loading point as directed by the Engineer.	Tkm	2300		
2	Alumino Thermit welding of 60kg/52 kg rail joints or combination joints of 60kg/52kg rail by pre-heat (SKV) welding technique using compressed air petrol/LPG for preheating, three piece pre-fabricated moulds (Zircon washed) single shot crucible fitted with automatic tapping thimbles with all labour, materials including supply of portion, tools and plants, aligning of rails, placing & fixing of mould, preheating, welding, mechanised trimming, grinding with profile grinder (including riser), testing, marking, painting with one coat of high build epoxy paint (two pack conforming to RDSO specification no. M&C/PCN-111/88) on the welded area up to 10 cm on either side. The work is to be completed in all respects as per IRS: T-19-2012 with latest updates and in accordance with "RDSO Manual for Fusion Welding of Rails by Alumino Thermic Process with up to date correction Slips in free rails or 3/10/20 rail panels. The work to be done under				

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
	supervision of trained welding supervisor and carried out by trained welder having valid competency certificate from RDSO/TPP, Lucknow. Ultrasonic testing of welded joints shall be paid separately under relevant items.				
2(a)	for 52kg, 72/90 UTS rails	Each	579		
3	Laying, B.G. straight or curve Track with 60 / 52 Kg. rails (SWR of 3 rail panel) and concrete sleeper 1540/km density with standard fittings ensuring correct spacing of sleepers, fixing and tightening of Fish Bolts & Nuts and maintaining proper gauge, alignment, level (both cross & longitudinal), expansion gap at rail joints, super elevation as necessary and with one round initial packing. The rate should be inclusive of de-linking of rails as required, cutting of rails as required on straight and curve track for squaring of joints, drilling holes on web of rail square to rail surface by using proper template and cutting GFN Liner as required for fish plated joints, chamfering of drilled holes, greasing and oiling of fish plates and fish bolts and nuts and at fishing zone of the rail ends including supply of grease oil etc. Sleepers spacing versine, super elevation etc. shall also be marked by the contractor with white paint at his own cost. The work has to be carried out as laid down in IRPWM and as per direction of the Engineer-in-Charge at site. The unit of track metre consists both sides rails, sleepers and all other fittings required thereof.	Tkm	5700		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
	(Transportation of Rail, Sleeper & Fittings from store to site will be paid separately)				
4	Through packing (1st, 2nd, 3rd & 4th) of any kind of sleepers with stone ballast to maintain correct alignment cross and longitudinal level as required for maintaining track gauge, versine, super-elevation etc. on both straight and curve track laid with contractor's tools and Plants (Note:- Multiply by 1.5 for Turnout length)				
4(a)	1st through packing	Tkm	5700		
4(b)	2nd through packing	Tkm	5700		
4(c)	3rd through packing (Under specific orders of Engineer-In-Charge)	Tkm	5700		
4(d)	4th through packing (Under specific orders of Engineer-In-Charge)	Tkm	5700		
5	Drilling holes 28mm dia. in rails 90R/52 kg/60 kg rails section for fish bolts outside/inside track.	Each	1754		
6	Cutting rails 52 kg/90R (New/SH) rails section for fish bolts outside/inside track by Rail cutting equipment.	Each	200		
7	Transportation of rails, switches, crossings, etc. from store to their final location of laying in track with all lead & Lift	MT	600		
8	Transportation of PSC sleeper from store to their final location of laying in track with all lead & Lift.	Each	8794		
9	Distribution of New/SH fittings & fastenings at site by contractors transport up to a distance of 2km including handling, loading, unloading of materials with all lead, lift, crossing road/rly. tracks etc. complete	MT	40		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
10	Manufacturing, supplying and laying at specified locations factory made CC block pavers for road surface of level crossings to RDSO Drg. No. M.00003, manufactured using 20mm size graded hard stone aggregates of approved quality with all contractor's cement, labour, tools/plant and curing with all lead & lift as per specifications and as directed by Engineer-in-Charge: 120mm thick blocks of M-40 grade for heavy traffic	Sqm	36		
11	Fixing check rails on level crossings with MS brackets, MS packing plates, bolts & nuts, spring washers etc. as per approved drawing & specifications, as directed. Rails, MS brackets, packing plates, bolts & nuts, spring washers will be supplied by Railways	Running Metre	20		
12	Installation of PSC fan shape turnouts, derailing switches 60 KG / 52 KG including lead rails as per RDSO layout drawings including katcha packing with bars or off-track tampers for 20 KMPH speed. Activities of rail cutting, drilling of holes, welding of joints and transportation are not included in this item and shall be paid separately under relevant items.				
12(a)	1 in 8½ Turnout	Set	4		
12(b)	1 in 12 Turnout	Set	1		
12(c)	Derailing Switch	Set	1		
13	Provision of Buffer stop of 60 KG, 52 KG, 90 R rail section as per plan including painting with luminous paint etc. as directed by the engineer. **Note**: Rail required for this item shall be paid separately under supply item of Rails.	Each	1		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
14	Fouling marks of size 1500x250x225 MM in M20 grade cement concrete including engraving the letters "FM", white washing with two coats and painting the letters in black enamel paint indicating the numbers of vehicles duly fixed at site.	Each	7		
15	Supply, installation, erection testing & commissioning of 120T Electronic Pit-less 52Kg Rail In- Motion Weigh Bridge as per the approved manufacturer & latest RDSO specifications. The rate includes supply of Weigh Bridge rails, PC with licenced software having facility for generating all reports, Printer, Cables, Power Supply & UPS backup for system, surge protection device, earthing, lamp post, as per standards & all other associated Civil works e.g. building etc. The rate shall also include calibration, testing, commissioning & obtaining all necessary approvals from competent authority after test wagon run & maintenance for one year from the date of commissioning.	Each	1		
16	Any other unforeseen items which are not covered by the items of work of (Schedule-2) will be operated as per **IR Unified Standard Schedule of Rates (Works & Materials), 2019. Basic Cost - Rs.10,00,000/-**	LS	LS	At Par / Below/ Above	
				TOTAL	
	Disposal of released Rails, Sleepers & Fittings. (Quantity to be assessed as per actual weighment)	MT	335.206		

Schedule–4 (Earthwork in Railway / Road formation)

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
1	Feeling of trees of girth (measured at a height of 1m above ground level) including lead & stacking of materials within 100m in addition to stumps are grubbed up.				
	a) Girth over 30cm and up to 60cm.	Each	1		
2	Earthwork in cutting (classified) in formation, trolley refuges, side drains, level crossing approaches, platforms, catch water drains, diversion of nallah & finishing to required dimension and slopes to obtain a neat appearance to standard profile inclusive of all labour, machine & materials and removing & leading all cut spoils either to make spoil dumps beyond 10m from cutting edge or for filling in embankment with leads within 2 km on either side of cutting edge, lifts, ascent, descent, loading, unloading, all taxes / royalty, clearance of site and all incidental charges, bailing & pumping out water, if required, etc. complete as per directions of the Engineer-in-Charge. The work is to be executed as per latest / updated edition of "Guidelines for Earthwork in Railway Projects" issued by RDSO, Lucknow. Cut trees shall be property of Railways and to be deposited in the railway godown unless specified otherwise in the Special Conditions of Contract.{Note - (i) All usable earth arising from cut spoils shall be led into bank formation and Unusable spoils shall be dumped / stacked (ii) All hard rock /and boulders not fit for filling will be stacked by the contractor and will be property of the Railways. classification of soil except rock	Cum	16560		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
3	Earthwork in filling in embankment, guide bunds, around buried type abutments, bridge gaps, trolley refuges, rain bunds, if provided, platforms etc. with earth, suitable for embankment as per RDSO latest Specifications and guidelines GE: G-14 of Soil Quality Class SQ1, excavated from outside railway boundary entirely arranged by the contractor at his own cost including all leads, lifts, ascents, descents, crossing of nallahs or any other obstructions. The item shall include demarcation and setting out of profile, site clearance, removing of shrubs, roots of vegetations growth, heavy grass, benching of existing slope of old bank, all handling/re-handling, spreading in layers with motor grader, bringing the moisture content to OMC, mechanical compaction to specified density and dressing of bank to final profile as a complete job. The payment shall be made as per finished profile and the rate shall include all costs including taxes, octroi, royalty etc. except for mechanical compaction which shall be paid extra under relevant item. Cut trees shall be property of railways and to be deposited in the railway godown unless specified otherwise in the Special Conditions of Contract.	Cum	25000		
4	Extra for mechanical compaction of soil in embankment with contractor's rollers of suitable capacity, type and size to achieve specified density as per specification, testing as per IS codes including cost of water, T&P, consumable and all labour as a complete job. The work is to be executed as per Latest edition of "Guidelines for Earthwork in Railway Projects" issued by RDSO, Lucknow.	Cum	25000		
5	Providing of Blanketing over finished formation as per latest RDSO specifications and procedures by supplying materials of approved quality, spreading in layers not exceeding in 30cm in thickness in loose conditions and levelling by	Cum	15000		

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
	motor grader and compacting by vibro roller of required capacity upto desired degree of compaction, finishing to correct profile with all lead and lift, complete in all respect to the satisfaction of the Engineer-in- Charge. Rate includes all labour, material, tools, plants, machinery, testing equipment, testing charges, taxes, Royalties, Octroi etc. and all other incidental charges including compaction. **Note**: (i) The work shall be carried out as per RDSO Guidelines and specifications for Design of Formation for Heavy Axle Load (Report No. RDSO/2007/GE: 0014 of November, 2009) for mechanically produced blanketing material for Railway Formation. (ii) The Quality Control tests as prescribed vide RDSO/2007/ GE: 0014 with up to date amendment shall be arranged at site by the Contractor, for which no separate payment will be made. (iii) The tenderer is requested to go through specifications of blanketing material as per GE-0014 RDSO specifications. The blanketing material is expected to be manufactured in quarry/ site with pug mill type blender from stone crushed material of required quality as per specification with the grading falling in the enveloping curve. The rate includes the CBR tests, Los Angeles Abrasion test, Impact tests, Atterberg limits, Grain size analysis, MDD and all quality tests as per specifications to be carried as per the laid down frequency on blanketing material/ compacted finished blanket surface. (iv) Measurement will be made on finished profile after compaction.				
6	Turfing / planting, including all lead & lift and watering as required until properly rooted with. **Note**- Initially payment of only 40% will be made. Balance 60% will be paid only after 3				

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
	months of maintenance period, if the turfing is properly rooted.				
7(a)	Turfing with planted doob grass	Sqm	5000		
7	Any other unforeseen items which are not covered by the items of work of (Schedule-1) will be operated as per IR Unified Standard Schedule of Rates (Works & Materials), 2019. Basic Cost – Rs.10,00,000/-	LS	LS	At Par/ Below / Above	
				TOTAL	

Schedule–5 (Bridge Work)

Item No.	Description	Unit	Quantity	Rate (INR)	Amount (INR)
1	Earthwork in excavation for foundations and floors of the bridges, retaining walls etc. including setting out, dressing of sides, ramming of bottom, getting out the excavated material, back filling in layers with approved material and consolidation of the layers by ramming and watering etc. including all lift, disposal of surplus soil upto a lead of 300m, all types of shoring and strutting with all labour and material complete as per drawing and technical specification as directed by Engineer in charge				
1(a)	All kinds of soils	Cum	18,730.80		
2	Providing and laying cement concrete, up to plinth in retaining walls, walls (any thickness) including attached plasters, columns, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets etc., excluding the cost of cement and of shuttering, centering.				
2(a)	1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size)	Cum	25.60		

Item No.	Description	Unit	Quantity	Rate (INR)	Amount (INR)
3	Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M35 grade (Cast in-Situ) in bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component using 20mm graded crushed stone aggregate and coarse sand of approved quality of cast in-situ RCC box of size upto 5m (bigger inside dimension) including finishing, Admixtures in recommended proportions (as per IS:9103), if approved in Mix design, to accelerate, retard setting of concrete, improve workability without impairing strength and durability, complete as per drawings and technical specifications as directed by Engineer-in-Charge. Payment for cement, reinforcement and shuttering shall be paid extra.	Cum	3,699.26		
4	Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Mass Cement Concrete M-20 grade (cast in-situ) using 20mm graded crushed stone aggregate and coarse sand of approved quality in Drop and curtain wall and alike structures below bed level, including the cost of centring, shuttering and finishing complete as per drawings and technical specifications as directed by Engineer. Payment for cement & reinforcement shall be paid extra.	Cum	477.20		
5	Centring and shuttering including strutting, propping etc. and removal of form for:				
5(a)	RCC Raft Foundation & Pile cap	Sqm	701.92		

Item No.	Description	Unit	Quantity	Rate (INR)	Amount (INR)
5(b)	Abutment, pier, wing walls and return walls	Sqm	8,182.60		
5(c)	In Bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component	Sqm	389.90		
6	Supply and using cement at worksite:				
6(a)	OPC 43 Grade	tonne	2,500.99		
6(b)	PPC	tonne	8.19		
7	Supplying reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete- High yield strength deformed bars				
7(a)	Thermo-Mechanically Treated bars	Kg	2,96,496.00		
8	Local sand / Pit sand / Yamuna sand for filing purposes	Cum	25.28		
9(a)	Providing Boulder Backing behind wing wall, return wall, retaining wall with hand packed boulders & cobbles with smaller size boulders toward the back including all lead, lift, labour & other incidental charges as complete work in all respect. Payment for boulder/ cobbles will be done extra.	Cum	79.68		
9(b)	Supply of boulder at site	Cum	79.68		
10	Providing and laying pitching with stone boulders weighing not less than 35 kg each with the void filled with spalls on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and technical specifications (filter media to be paid separately under the relevant items)	Cum	1		
11	Providing and laying filter Material as per RDSO Specification underneath pitching in slopes complete as per drawing and Technical Specification	Cum	7,356.02		

Item No.	Description	Unit	Quantity	Rate (INR)	Amount (INR)
12	Providing, hoisting and fixing in position M-25 Grade reinforced cement concrete in precast standard platform wall sections including the cost of centering, shuttering, finishing, admixtures in recommended proportion (as per IS:9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, but excluding cost of cement and steel reinforcement as per approved plan & as per direction of the Engineer-in-Charge	Cum	2,251.50		
13	Providing and fixing at or near ground level, Precast M 20 grade cement concrete as per approved design and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), including the cost of required centering and shuttering complete but excluding the cost of cement (cast at site) in kerbs, edging etc.	Cum	136.80		
14	Supplying and laying interlocking pre-cast CC block pavers of approved design factory manufactured of specified grade cement concrete on passenger platform, footpaths, circulating area etc. including setting in position over 25mm thick bedding layer of fine sand, filling the joints with fine sand, levelling including compaction as perIS:1565860 mm thick blocks of M-30 grade for light traffic	Sqm	1		
15	Providing, cutting, fabricating, treating, fixing structural steel as per IS:2062 in access ladders (top of girder/slab to pier cap), inserts, platforms, railing, trolley refuges,	Kg	1		

Item No.	Description	Unit	Quantity	Rate (INR)	Amount (INR)
	drain pipes etc. by drilling holes and grouting with C.C. as per specifications including painting with two coats of approved paint over two coats of primer. (cement for grouting shall be paid separately)				
16	Providing weep holes by making suitable opening or drilling in existing Brick Masonry / Plain / Reinforced Concrete abutment, wing wall/return wall with 100 mm dia AC pipe, extending through the full width of the structure complete	Rm	200.00		
				TOTAL	

Schedule-6 (Road Work)

S. No.	Description of Items	Unit	Quantity	Rate (INR)	Amount (INR)
1	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.	Sqm	4500		
2	Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road/vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density.	Cum	675		
3	2.5 cm premix carpet surfacing with 3 cum of stone chippings 10 mm nominal size per 100 sqm and bitumen emulsion (medium setting min. 65% bitumen contents) complying with IS: 8887, using 96 kg per cum of chippings of road surface, including consolidation with road roller etc. complete.	Sqm	4500		
				TOTAL	