डेडीकेटेड फ्रेट कोरीडोर

Tender No. MTC-EN-LC43-EDFC-ROB

For

Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor.

E-TENDER DOCUMENT
TECHNICAL BID
PACKET-A
August- 2020

Employer:
DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

Under

MINISTRY OF RAILWAYS

General Manager/Co-ordination,
Project Off: 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B,
Sector -1, Ved Vyas Puri, Meerut -250002

CORPORATE OFFICE: -
5th Floor, Supreme Court Metro Station Building Complex,
New Delhi-110001.

INDEX

(S.K. Singh)
Sr Dy GM/C/RCED.

राइट्स लिमिटेड/RITES LIMITED
राइट्स भवन
RITES Bhawan
प्लाट सं.-1/Plot No.1
सैक्टर-29/Sector-29
गुडगाँव-122001/GURGAON-122001

NOTICE INVITING E-TENDER

PART - I
Chapter - I

DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)

No: MTC-EN-LC43-EDFC-ROB **DATE: 25.08.2020**

NOTICE INVITING E-TENDER
National Competitive Bidding

Dear Sirs,

1.1.1 GM/CO/Meerut, Dedicated Freight Corridor Corporation of India Limited (DFCCIL), 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut -250002, India, invites e-tenders on two packet system on prescribed forms from firms / Companies / Joint Ventures having requisite experience and financial capacity for execution of the following work:

Tender No.	**MTC-EN-LC43-EDFC-ROB**
Name of Work	Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor
Employer	**General Manager/Co/Meerut** Dedicated Freight Corridor Corporation of India Ltd., 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut -250002, U.P.
Type of Tender	Open E-Tender (Single stage two packet)
Type of Contract	Works Contract
Estimated Cost	**Rs. 32,66,73,020/-** (Rs. Thirty-two Crore Sixty-Six Lakh Seventy-Three Thousand Twenty rupees only)
Completion Period	18 Months
Earnest Money Deposited (EMD)	**Rs 50,00,000** (Rs. Fifty Lakhs only)
Cost of Tender Document	₹ 11,800 (Rupees Eleven Thousand Eight Hundred only),
E-tendering website	www.ireps.gov.in
Date of uploading of NIT & Bid document (online publishing date)	On 25.08.2020

Start Date of Tender document download (Online)	From 26.08.2020
Issue of Corrigendum, if any	On or before last fifteen days from last date of submission (on www.ireps.gov.in, www.dfccil.com)
Date & Time of Submission of Tender	On or before Date 25.09.2020 and time upto 15:00 hrs
Last date of submission of EMD, tender document cost	On or before Date 25.09.2020 and time upto 15:00 hrs
Date & Time of Opening of Technical Bid of Tender	On Date 25.09.2020 and time 15:30 hrs
Validity of Offer	120 days
Retention Money/ Security Deposit	5% of Contract value
Performance Guarantee	Performance Guarantee (PG) have to submit within 30 (thirty) days from the date of issue of Letter of Acceptance (LOA), amounting to 5% of the contract value in the form as give in clause 16.(4) of GCC.

1.1.2 Eligibility shall be assessed on applicants, fulfilling the technical capability as well as for financial as specified in clause no. 1.3.13 (i) A & B of Preamble and General Instruction to tenders (Part - I, Chapter III).

1.1.3 Tender document can be downloaded from DFCCIL's website www.dfccil.com, www.ireps.gov.in & Central Procurement portal eprocure.gov.in. Tenderers are advised not to make any corrections, additions or alterations in the downloaded tender documents. In case, any corrections additions or alterations in the downloaded tender documents are made, such tender shall summarily be rejected.

1.1.4 DFCCIL may issue addendum(s) / corrigendum(s) to the tender documents. In such cases the addendum(s) / corrigendum(s) shall be issued and placed on DFCCIL's website: www.dfccil.com, www.ireps.gov.in & Central Procurement portal https:// eprocure.gov.in at least fifteen days in advance of date of opening of tender. The tenderer who have downloaded the tender documents from the website before issue of addendum(s)/ corrigendum(s) must visit the website and ensure that such addendum(s) / corrigendum (s) (if any) is also downloaded by them. Such addendum(s) / corrigendum (s) (if any) shall also be submitted duly stamped and signed along with the submission of tenders. Any tender submitted without addendum(s) / corrigendum(s) (if any) shall be summarily rejected.

1.1.5 The tender documents shall be submitted **in online mode only** through website www.ireps.gov.in in two bids only viz Packet - A containing TECHNICAL BID and Packet B containing FINANACIAL BID. Detailed credential as per the requirement of eligibility criteria and all tender papers except Bill of Quantities are to be submitted in technical bid.

Summary of Prices (Form No. 3) with percentage (%) above or below or at par on the amount of schedules "1" duly filled in along with Schedule of Prices (Form - 4) are to be submit online mode only in "Financial Bid". **Bidder shall submit the EMD & Tender documents cost (as mentioned in clause 1.3.8 & 1.3.4.3 of preamble & general instructions to tenderer, Part I, Chapter III) in DFCCIL Bank Account as mentioned below through net banking or payment gateway (Online Mode only) On or before schedule date & time of submission of bid. The proof of submission of EMD & Tender documents cost should be uploaded/attached along with Bid/offer document.** Financial Bid (as specified in "Financial Bid" in Tender Document) duly filled in is to be uploaded in "Financial packet". The rates must be filled after downloading the financial bid document in the prescribed format from the website www.ireps.gov.in. The financial bid should be downloaded & then filled up, saved and uploaded on the E-tendering website using digital signature for signing the document.

Name of Account: - Dedicated Freight Corridor Corporation of India Ltd,
Name of Bank: - Union Bank of India, Moti Bagh Branch New Delhi 110066.
Account Number: - 496601010035635
Type of account: - Current Account.
IFSC code: - UBIN0546836

1.1.6 To participate in the E-Bid submission, it is mandatory for the bidders to have user registration on IREPS Portal and valid Class III DSC as required by IREPS

1.1.7 Tenders shall be opened at the address given below on Date 25.09.2020 at 15:30 hours in the presence of the tenderers or their authorized representatives intending to attend the opening. Address of Office for opening of tenders: - **General Manager/Co/Meerut**, DFCCIL, 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut -250002, U.P. All the Bids received shall be opened on the date and time mentioned above in the tender notice. Bid of the bidders shall be opened through process of e-tendering. The sequence of opening shall be:

i) Technical offer;

ii) Financial offer (After scrutiny of Technical Bid).

1.1.8 Tender shall be submitted as per "General Instruction to Tenderers" forming as part of the complete tender document.

1.1.9 Any tender submitted without Earnest money and cost of tender documents as specified in the tender document shall not be considered and shall be summarily rejected.

1.1.10 DFCCIL reserves right to cancel the tender before submission / opening of tender, postpone the tender submission / opening date and to accept / reject any or all tenders without assigning any reason thereof. DFCCIL's assessment of suitability as per eligibility criteria shall be final and binding.

1.1.11 Tenderers may note that they are liable to be disqualified at any time during tenderring process in case any of the information furnished by them is not found to be true. EMD of such tenderers shall be forfeited. The decision of DFCCIL in this regard shall be final and binding.

1.1.12 Information as required as per various Forms to tender document should be submitted by the tenderers without fail strictly as per formats. If tenderer fails to submit duly filled form strictly in format, the Bid should be treated as non responsive Bid and should not be considered for further evaluation.

1.1.13 The validity of offer shall be 120 days from the date of opening of the tender.

1.1.14 Tenderer can submit tender online only on www.ireps.gov.in

1.1.15 Tenderers must read all instructions regarding e-tendering process as mentions user manual on www.ireps.gov.in portal.

1.1.16 Tenderers are advised to regular visit the websites for information regarding tender. Corrigendum, addendum (if any) will be uploaded on DFCCIL website: www.dfccil.com, www.ireps.gov.in & Central Procurement portal https:// eprocure.gov.in

General Manager/Co-ordination/Meerut
For & on behalf of DFCCIL

GENERAL INFORMATION / DATA SHEET

PART - I
Chapter - II

GENERAL INFORMATION/DATA SHEET

TENDER NOTICE NO	**MTC-EN-LC43-EDFC-ROB, DATE 25.08.2020**
Name of the work	Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor.
(a) Tender Value or Estimated Cost	**₹ 32,66,73,020/-** (Rs. Thirty-two Crore Sixty-Six Lakh Seventy-Three Thousand Twenty rupees only)
(b) Completion Period	18 months
(c) Earnest Money Deposit	₹ 50,00,000/- (Rs. Fifty Lakhs only)
(d) Date of uploading of NIT & Bid documents (online publishing date)	On 25.08.2020
(e) Last date and Time of submission of Tender	Date 25.09.2020 upto15:00hrs
(f) Date and Time of Opening of Tender (Technical bid -Packet A)	Date 25.09.2020 at 15:30 hrs
(g) Validity of offer	120 days
(h) Retention Money / Security Deposit	5 % of Contract Value
(i) Performance Guarantee	Performance Guarantee (PG) have to be submitted within 30(thirty) days from the date of issue of Letter of Acceptance (LOA), amounting to 5% of the contract value in the form as give in clause 16. (4) of GCC

PREAMBLE & GENERAL INSTRUCTION TO TENDERERS

PART - I
Chapter- III

PREAMBLE & GENERAL INSTRUCTIONS TO TENDERERS

1.3.1 Introduction

(i) General

Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL), a Public Sector Enterprise has been formed under the Indian Companies Act, 1956 for implementation of Dedicated Freight Corridor Project. Government of India is the sole shareholder of the DFCCIL.

Ministry of Railways (MOR), Government of India has planned to construct Dedicated Freight Corridor (DFC) covering about 3338 route Kilometres on Eastern and Western Corridors. The coverage of Eastern Corridor is from Ludhiana to Dankuni and Western Corridor is planned from Jawaharlal Nehru Port, Mumbai to Dadri near Delhi. There will be a linkage between two corridors at Dadri.

(ii) Eastern Dedicated Freight Corridor

Eastern DFC Route will be approximately 1839 Km long from Dankuni to Ludhiana via Dankuni – Asansol – Dhanbad – Gaya – Sonnagar - Mughal Sarai - Allahabad - Kanpur - Tundla - Aligarh - Khurja – Dadri & Khurja - Bulandshahar – Meerut – Saharanpur – Ambala - Ludhiana. Proposed alignment of DFC has been generally kept parallel to existing Indian Railway line except provision of detours at some stations where the existing yards /cities are congested.

Level Crossings (LC's) are generally unsafe locations and also a congestion points for road/rail's users. These LC's are operational bottlenecks for Railways /DFCCIL in terms of loss in punctuality and reduction in line capacity. Construction of ROB(s)/ RUB(s) is financially and operationally beneficial apart from the fact that it improves the safety of Rail / Road users.

Road over bridges (ROB) are being constructed on the level crossings falling on Eastern Corridor of DFCCIL. These ROBs shall span over the existing railway lines and the proposed DFCCIL lines with bow string girders and composite girders with suitably designed RCC abutments, piers and foundations including staircases and other allied components. Depth of type of foundation shall be decided/ designed based on detailed geotechnical investigation at ROBs sites.

(iii) General Instructions (for on line tendering system):

Submission of Online Bids is mandatory for this Notice Inviting Tender. E-Tendering is a new methodology for conducting Public Procurement in a transparent and secured manner. Suppliers/ Vendors will be the biggest beneficiaries of this new system of procurement. E-tender in DFCCIL will be hosted on http://www.ireps.gov.in

(a) Accessing of bid documents:

It is mandatory for all the Bidders to have class-III digital signature certificate (in the name of person who will sign the Bid) from any of the licensed certifying agency ("CA") [Bidders can see the list of licensed CAs from the link www.cca.gov.in] to participate in e-tendering of DFCCIL.

The BID DOCUMENTS can be viewed /downloaded from the website www.dfccil.com, www.ireps.gov.in & Central Procurement portal https:// eprocure.gov.in free of cost till one day prior to last date of submission of the Application upto 15.00 hrs.

Following may be noted-

(i) Bids can be submitted only during the validity of registration with the ireps.gov.in.
(ii) The amendments to the BID DOCUMENTS, if any, will be posted on the website www.dfccil.com, www.ireps.gov.in & Central Procurement portal https:// eprocure.gov.in
(iii) Registration with the ireps.gov.in should be valid at least upto the date of submission of bid.

(b) Preparation & submission of applications:

Detailed BID DOCUMENTS may be downloaded from www.ireps.gov.in and the Bid may be submitted online following the instructions as per user manual on www.ireps.gov.in portal. A Vendor manual containing the detailed guidelines for e-tendering system is available on ireps.gov.in.

Only Electronic Form (to be uploaded on the ireps.gov.in)

Submission of Financial & Technical bid in prescribed Format in ONLINE MODE Only. No other mode of submission accepted.

(c) Document should be uploaded on the ireps.gov.in site (On line mode only)

The tenderers are compulsorily required to upload the following document without which the offer will be considered incomplete and shall be summarily rejected

(i) Copy of PAN Card

(ii) Copy of GST Registration Certificate. In case the tenderer is yet to get GST registration Number, Upload the proof for applying GST Registration.

(iii) Integrity Pact as per Form No. 20

(iv) Registration Certificate, if any, under Labour Law.

(v) Tenderers are required to upload affidavit as per Form No. 21 as stipulated in clause 1.1.13 (ii) (e) regarding documents in support of his/their claim to fulfil the eligibility criteria in the tender document.

(vi) List of Plant & Machinery available with the Tenderer etc. as per clause 2.2.20 of tender document.

(vii) Power of Attorney (PoA) for signing the Application as per Form no. 13

(viii) If applicable, the Power of Attorney for Lead Member of Consortium/JV; as per Form no. 12

(ix) An undertaking from the person having PoA referred in sub clause (a) above that they agree and abide by the bid documents uploaded by DFCCIL and amendments uploaded, if any.

(x) SUBMISSION OF FINANCIAL ELIGIBILITY CRITERIA CREDENTIALS in prescribed format mentioned in BID DOCUMENTS

(xi) SUBMISSION OF TECHNICAL ELIGIBILITY CRITERIA CREDENTIALS in prescribed format mentioned in BID DOCUMENTS

(xii) Copy of Memorandum and Articles of Association, if the Applicant is a body corporate, and if a partnership then a copy of its partnership deed;

(xiii) Technical Bid Packet-A, Financial Bid Packet-B and other relevant documents.

(xiv) Copy of the Joint Bidding Agreement, in case of a Consortium;

(xv) Memorandum of Understanding (in case of JV) as per Form no. 9.

(xvi) Contractor shall submit cost of BID DOCUMENTS of ₹ 11,800/- (Rupees Eleven thousand eight hundred only) in DFCCIL Bank Account as mentioned in clause 1.3.4.3 of preamble & general

instructions to tenderer, Part I, Chapter III through net banking or payment gateway (Online Mode only) on or before schedule date & time of submission of bid. The proof of submission Tender documents cost should be uploaded/attached along with Bid/offer document.

(xvii) The Earnest money should be deposited by the tenderer in DFCCIL Bank Account as mentioned clause 1.3.8 of preamble & general instructions to tenderer, Part I, Chapter III through net banking or payment gateway (online mode only) on or before Schedule date & time of submission of bid. The proof of submission of EMD should be uploaded/attached along Bid/offer document.

(xviii) The Bidder shall upload scanned copies of the documents on the ireps.gov.in on or before due date & time. No hard copy of the documents is required to be submitted.

(xvii) A copy of the tender papers duly signed in ink by the tenderer, on each and every page in token of his having studied the tender papers carefully shall be uploaded.

Please ensure that all uploaded documents should be digital signed.

The name of the downloaded files should not be changed.

While uploading the documents, it should be ensured that the file name should be the name of the document itself. The entire technical document through digital signature would first be uploaded in 'Document Library' and after that, attach entire tender document in the particular tender.

(d) Digital Certificates

For integrity of data and its authenticity/non-repudiation of electronic records and to be compliant with IT Act 2000, it is necessary for each user to have a Class Three Digital Certificate (DC), also referred to as Digital Signature Certificate (DSC), of Class-III issued by a Certifying Authority (CA) licensed by Controller of Certifying Authorities (CCA) [refer http://www.cca.gov.in].

(iv) Scope of Work

On behalf of DFCCIL, General Manager/Co/ Meerut, Dedicated Freight Corridor Corporation of India Limited, 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut - 250002, India herein after referred to as 'DFCCIL' is inviting e-tenders from Firms/ Companies/Joint Ventures having requisite experience and financial capacity for execution of the following work:

"Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor"

(v) Scope of work is as per the requirements given in the bid document but not limited to:

For Railway Portion of ROB for LC no. 43

(a) Construction of RCC open foundation / pile foundation & pile cap as per approved drawings.

(b) Construction of RCC abutments and piers, for Composite Plate Girders and Bow String Girders as per approved drawings.

(c) Preparation of Temporary Arrangement Drawings (TAD), Launching Scheme and approval thereof for spans over Indian Railway (IR) running lines and DFCCIL lines.

(d) Fabrication of bow string girders of 72 m span including erection with traffic power block.

(e) Construction of approximate 12 m wide RCC deck slab on Bow String Girders.

(f) Providing and fixing in position standard fixed type POT bearing, free & guided sliding type POT cum PTFE bearings, Pin and Metallic Guide Bearings as per approved drawings.

(g) Providing and laying cement concrete wearing coat, drainage spouts, footpath, road markings, etc.

(h) Providing and fixing RCC crash barrier, RCC railing (As per MORTH design), steel railing and electric lighting poles.

(i) Providing and fixing in position single strip seal elastomeric type expansion joints.

(j) Construction of Inspection platform, railing, ladders, etc.

(k) Construction of RCC staircases.

(l) Providing and fixing of protection screens.

(m) Other miscellaneous works.

(n) Construction of LHS

For Approach Portion of ROB for LC no. 43

(a) Construction of RCC Piers for PSC/RCC Girders as per IRC loading, including open/pile foundation.

(b) Construction of Post tensioned Pre-stressed (PSC) Girder and erection over piers.

(c) Providing and fixing in position standard bearings, as per approved drawings.

(d) Construction of RCC deck slab over PSC/RCC Girders.

(e) Preparation of Temporary Arrangement Drawings (TAD), Launching Scheme for approach spans.

(f) Construction of approaches which includes constructing of RE wall, RCC slab, piers, crash barrier, earthwork in bank, providing bituminous road & all works related to constructing approaches complete.

(g) Preparation of Quality Assurance Plan (QAP) for sub-structure, foundation, super-structure including bearings.

(h) Providing and laying cement concrete wearing coat, mastic flooring, drainage spouts and footpath etc.

(i) Providing and fixing RCC crash barrier, RCC railing (As per MORTH design), steel railing, electric lighting poles and road markings, etc.

(j) Providing and fixing in position expansion joints.

(k) Making any temporary work for the purpose or arranging any temporary land for the working or stacking of materials of contractor.

(l) Preparation of 5m wide service road on each side of approach & providing RCC slab for service road over canal (if any) after getting approval from U.P. Irrigation Department.

(m) Reroute/Installation of pipes/culverts for agricultural drains (if any) crossing approach viaduct.

(n) Other miscellaneous works.

(vi) Cost of the work: The estimated cost of the tendered work is given in Chapter-II of PART-I of this document.

(vii) The tenderer shall be governed by General Conditions of Contract (GCC), Preamble and General Instructions to Tenderers (ITT) and Special Conditions of Contract (SCC). Wherever, there is a conflict in any condition between GCC and Special Conditions of Contract mentioned in the tender documents, the condition mentioned in Special Conditions of Contract will prevail. However, Engineer's decision in this connection shall be final and binding.

Part I, Chapter-IV and V of the tender document contains General Conditions of Contract and Special Conditions of Contract specific to this work and shall be applicable in the contract.

(viii) Location

Works are to be executed between Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor. However, DFCCIL reserves right to change the site of work anywhere in adjacent/adjoining area of the work defined in Para 1.3.1(iv) above in the jurisdiction and the contractor shall be bound to execute the work without any extra cost.

1.3.2 (a) Tender Bid

The Tender Bid shall be submitted **through online only on website www.ireps.gov.in** as under: **-**

Packet -A

Eligibility/Qualifying element of the Tender Bid along with other documents mentioned in para 1.3.2 (b) (i), here in after called “TECHNICAL BID “

Packet- B

Price elements of the Tender Bid as per para 1.3.2 (b) (ii), herein after called “FINANCIAL BID”. The TECHNICAL BID (Packet-A) shall be opened on the date of tender opening and the detailed scrutiny of TECHNICAL BID shall be carried out. The **“**FINANACIAL BID” (Packet-B) shall be opened only of those tenderers who qualify in “Technical bid”. The detailed procedure for tender opening and processing is given in Para 1.3.5.

1.3.2(b) Form of Tender

The Tender documents shall be in **two separate packets** viz: **-**

"Packet-A "containing technical bid and "Packet–B "containing financial bid. Detailed credentials as per the requirement of eligibility criteria and all tender papers except Summary of Prices and Schedule of Prices are to be uploaded in "TECHNICAL BID" i.e. Packet-A. Summary of Prices and Schedule of Prices with percentage above /below / at par duly filled in are to be submitted in "FINANCIAL BID".

Tenders not uploaded in the proper Forms shall be summarily rejected.

(i) Documents to be enclosed with the TECHNICALBID (Packet-A):

S. No.	Description	Documents
(1)	Offer letter complete.	Form No.1
(2)	Tenderer's credentials in accordance With para1.3.13 (i) & (ii) of Preamble and General Instructions to Tenderers.	Form No. 2A,2B & 2C
(3)	Earnest money in accordance with Para 1.3.8 and Cost of Tender Document in case of downloaded tenders in accordance with Para1.3.4.3 of Preamble and General Instructions to Tenderers in an envelope.	
(4)	Written confirmation authorizing the signatory of the tender to commit the tenderer and other documents as per format as applicable, in accordance with para1.3.6 of Preamble and General Instructions to Tenderers.	
(5)	A copy of the tender papers duly signed in ink by the tenderer, On each and every page in token of his having studied the tender papers carefully shall be attached with the tender.	

(ii) Documents to be uploaded with the FINANCIAL BID (Packet B): -

S. No	Description	Documents
(1)	Summary of Prices, Schedule of Prices & Total Prices	Form No.3 & 4

1.3.3 Deleted.

1.3.4 Submission of Tender Document

1.3.4.1 Tender document can be submitted only on www.ireps.gov.in

1.3.4.2 Clause applicable for tender documents downloaded from Internet

Tenderer/s is free to download tender documents at their own cost, for the purpose of perusal as well as for using the same as tender document for submitting their offer. Master copy of the tender document will be available in the office of General Manager/Co/ Meerut, DFCCIL, 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut -250002, India.

After award of the work, an agreement will be drawn up. The agreement shall be prepared based on the master copy available in the office of Chief General Manager/Meerut, DFCCIL, 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri, Meerut -250002, India and not based on the tender documents submitted by the Tenderer. In case of any discrepancy between the tender documents downloaded from the internet and the master copy, later shall prevail and will be binding on the Tenderers. No claim on this account shall be entertained.

1.3.4.3 Cost of Tender documents downloaded from internet

Tender documents are available on Dedicated Freight Corridor Corporation of India Limited website i.e. “www.dfccil.com & www.ireps.gov.in "and the same can be downloaded and used as tender documents for submitting the offer. The cost of the tender document as indicated above in NIT. The cost of the tender document & EMD will have to be deposited by the tenderer in DFCCIL Bank Account as mentioned below through net banking or payment gateway (online mode only) on or before schedule date & time of submission of bid. The proof of submission of EMD & Tender documents cost should be uploaded/attached along with Bid/offer document. The cost of the tender document & Earnest Money Deposit should be paid separately and not to be clubbed together. In case, tender is not accompanied with the cost of the tender document as detailed above, tender will be summarily rejected.

Name of Account: - Dedicated Freight Corridor Corporation of India Ltd, Meerut
Name of Bank: - Union Bank of India, Moti Bagh Branch New Delhi 110066.
Account Number: - 496601010035635
Type of account: - Current Account.
IFSC code: - UBIN0546836

1.3.4.4 Complete tender documents (Technical bid & Financial bids) must be submitted online duly completed in all respect **upto 15.00 Hrs on 25.09.2020. The “Packet-A (TECHNICAL BID)”** will be opened at **15.30 Hrs** on the same day and read out in the presence of such tenderer(s) as is/are present. In case the intended date for opening of tenders is declared a holiday, the tenders will be opened on the next working day at the same time.

1.3.4.5 Financial Bid to be downloaded from website www.ireps.gov.in and then, filled, saved and uploaded (through digital signature) on the same website and not to be submitted in hard copy at all. ***The financial bid (after filling the rates) should neither be scanned & uploaded, nor, the hard copy should be submitted to the office of*** **General Manager/Co/*Meerut.***

1.3.4.6 Deleted.

1.3.4.7 Each page of the tender papers is to be signed by the tenderers or such person/s on his/their behalf that is/are legally authorized to sign for him / them. Tenderders are required to mention the total no of papers submitted/uploaded in their bid.

1.3.4.8 Care in Submission of Tenders –

(a) (i) Before submitting a tender, the tenderer will be deemed to have satisfied himself by actual inspection of the site and locality of the works, that all conditions liable to be encountered during the execution of the works are taken into account with that the rates he enters in the tender forms are adequate and all-inclusive to accord with the provisions in clause-37 of the Standard Conditions of Contract for the completion of works to the entire satisfaction of the Engineer.

(ii) Tenderers will examine the various provisions of the Central Goods and Services Tax Act, 2017(CGST)/Integrated Goods and Services Tax Act, 2017(IGST)/Union Territory Goods and Services Tax Act, 2017(UTGST)/respective state's State Goods and Services Tax Act (SGST) also, as notified by Central/State Govt. & as amended from time to time and applicable taxes before bidding. Tenderers will ensure that full benefit of Input Tax Credit (ITC) likely to be availed by them is duly considered while quoting rates.

(iii) The successful tenderer who is liable to be registered under CGST/IGST/UTGST/SGST Act shall submit GSTIN along with other details required under CGST/IGST/UTGST/SGST Act to DFCCIL immediately after the award of contract, without which no payment shall be released to the contractor. The contractor shall be responsible for deposition of applicable GST to the concerned authority.

(iv) In case, the successful tenderer is not liable to be registered under CGST/IGST/UTGST/SGST Act, DFCCIL shall deduct the applicable GST from his/their bills under reverse charge mechanism (RCM) and deposit the same to the concerned authority.

(b) When work is tendered for by a firm or company, the tender shall be signed by the individual legally authorized to enter into commitments on their behalf.

(c) The DFCCIL will not be bound by any power of attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. It may, however, recognize such power of attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the Contractor.

1.3.4.9 Tenders containing erasures and/or alteration of the tender documents are liable to be rejected. Any correction made by Tenderer(s) in his/their entries must be attested by him/them.

1.3.5 Opening of Tender:

(a) Tender will be opened at 15.30 hrs. On **25.09.2020**,
(b) **'TECHNICAL BID (Packet- A)**' only of all the tenderers shall be opened and the contents there of i.e. Name of tenderers, presence of EMD etc. shall be read out.

(c) After the opening of "TECHNICAL BID" (Packet-A) of all the tenderers, these bids shall be scrutinized and analyzed. If found necessary by the Employer, the tenderers shall be asked to furnish clarifications and the Employer may also hold discussions with the tenderers after giving due notice. The names of the tenderers whose bid are considered complete and meet eligibility criteria shall be short listed.

(d) The **FINANCIAL BID** (**Packet –B)** shall be opened on a subsequent date and time duly notified well in advance. The Financial bids of only those tenderers shall be opened who are short listed after scrutiny of their Technical bid. The Financial bid of the tenders who do not qualify during scrutiny of Technical bid shall not be opened. The time of opening, date and venue shall be advised to qualified tenderers well in advance to enable them to depute their representative. The earnest money of non-qualifying tenderers will be returned back within a reasonable period of completion of results of Technical bid.

1.3.6 Constitution of the Firm: -

1.3.6.1 Tenderer shall clearly specify whether the tender is submitted on his own or on behalf of a partnership firm / Joint Venture (JV) / Company. The tenderer(s) who is / are constituents of the firm / Company, shall enclose self-attested copies of the constitution of their concern, Partnership Deed and Power of attorney along with their tender. Tender documents in such cases shall be signed by such persons as may be legally competent to sign them on behalf of the firm / company as the case may be.

1.3.6.2 The tenderer shall give full details of the constitution of the Firm / JV / Company and shall also submit following documents (as applicable), in addition to documents

mentioned above:

(a) Sole Proprietorship Firm: The tenderer shall submit the notarized copy of the affidavit.

(b) Partnership Firm: The tenderer shall submit self-attested copies of (i) registered / notarized Partnership Deed and (ii) Power of Attorney duly authorizing one or more of the partners of the firm or any other person(s), authorized by all the partners to act on behalf of the firm and to submit & sign the tender, sign the agreement, witness measurements, sign measurement books, receive payments, make correspondences, compromise /settle /relinquish any claim (s) preferred by the firm, Sign "No claim Certificate", refer all or any dispute to arbitration and to take similar action in respect of all tenders / contracts or said tender / contract.

(c) Joint Venture: The tenderer shall submit documents as mentioned in clause 65 to GCC. In case, tenderer fails to submit any of the forms especially pertaining to Joint Venture i.e. Form No.9 to 13, the bid shall be treated as Non-Responsive Bid and shall summarily be rejected.

(d) Companies registered under Companies Act-1956: The tenderer shall submit (i) the copies of Memorandum of Association (MOA) and Articles of Association (AOA) of the company; and (ii) Power of attorney duly registered / notarized by the company (backed by the resolution of Board of Directors) in favour of the individual, signing the tender on behalf of company.

1.3.6.3 If it is mentioned in the tender submission that it is being submitted on behalf of / by a sole Proprietorship Firm / Partnership Firm / Joint Venture / registered Company etc. but above-mentioned documents (as applicable) are not enclosed along with tender, the tender shall be summarily rejected.

If it is NOT mentioned in the tender submission that it is being submitted on behalf of / by a Sole Proprietorship Firm / Partnership Firm / Joint Venture / Registered company etc., then the tender shall be treated as having been submitted by the individual who has signed the tender.

After opening of the tender, any document pertaining to the constitution of the Firm / Joint Venture etc. shall neither be asked nor be entertained / considered by DFCCIL.

1.3.6.4 Deleted

1.3.6.5 The DFCCIL will not be bound by any power of attorney granted by the tenderer or by changes in the composition of the Firm made subsequent to the submission of tender. It may, however, recognize such power of attorney and changes after obtaining proper legal advice.

1.3.7 Validity of Tender: -

Tenderer shall keep his offer open for a minimum period of 120 days from the date of opening of the tender or as mentioned in the Tender Notice.

1.3.8 Earnest Money: -

(a) The tender must be accompanied by Earnest Money in favour of '**Dedicated Freight Corridor Corporation of India Limited, Meerut'** deposited in any of the forms as mentioned in 1.3.8(c), failing which the tender will not be considered.

(b) The Earnest money should be deposited by the tenderer in DFCCIL Bank Account as mentioned below through net banking or payment gateway (online mode only) on or before Schedule date & time of submission of bid. The proof of submission of EMD should be uploaded/attached along Bid/offer. The particulars of DFCCIL Bank Account is given as under:

Name of Account: - Dedicated Freight Corridor Corporation of India Ltd, Meerut
Name of Bank: - Union Bank of India, Moti Bagh Branch New Delhi 110066.
Account Number: - 496601010035635
Type of account: - Current Account.
IFSC code: - UBIN0546836

(c) The earnest money of the unsuccessful tenderer(s) will be returned to the unsuccessful tenderer(s). No interest shall be paid by DFCCIL on earnest money amount.

1.3.9 Execution of Contract Agreement: -

The Tenderer whose tender is accepted shall be required to appear in person at the office of **General Manager/Co**/Meerut, **Dedicated Freight Corridor Corporation of India Limited,** 3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector - 1, Ved Vyas Puri, Meerut -250002, India or if a firm or corporation, a duly authorized representative shall so appear and execute the contract agreement within 30 days after notice that the contract agreement is ready. Failure to do so shall constitute a breach of the agreement affected by the acceptance of the tender in which case the full value of the earnest money accompanying the tender shall stand forfeited without prejudice to any other rights or remedies.

In the event of any tenderer whose tender is accepted refuses to execute the contract agreement as here in before provided, DFCCIL may determine that such tenderer has abandoned the contract and there upon his tender and acceptance thereof shall be treated as cancelled and DFCCIL shall be entitled to forfeit the full amount of the Earnest Money.

1.3.10 Security Deposit on Acceptance of Tender:

The security deposit / rate of recovery / mode of recovery on acceptance of tender shall be as per the Para 16. (1) to 16. (3) of General Conditions of Contract (GCC).

1.3.11 Tenderer's Address

The tenderer should state in the tender his postal address, Mobile no. and email address legibly and clearly. Any communication sent in time, to the tenderer by post at his said addresses shall be deemed to have reached the tenderer duly and in time.

1.3.12 Right of DFCCIL to Deal with Tenders

(a) The DFCCIL reserves the right of not to invite tenders for any of DFCCIL work or works or to invite open or limited tenders and when tenders are called to accept a tender in whole or in part or to reject any tender or all tenders without assigning reasons for any such action.

(b) The authority for the acceptance of the tender will rest with the DFCCIL. It shall not be obligatory on the said authority to accept the lowest tender or any other tender and no tenderer(s) shall demand any explanation for the cause of rejection of his/their tender nor the DFCCIL undertake to assign reasons for declining to consider or reject any particular tender or tenders.

1.3.13(i) Eligibility Criteria

(A): Technical Eligibility Criteria

Criteria	**Compliance Requirement**		**Documents**
Requirement	**Single Entity**	**Joint venture**	**Submission Requirements**
(i) The tenderer / JV firm or Lead Member of JV firm must have satisfactorily completed at least one single work in last three previous financial years and the current financial year upto the date of submission of tender, of construction of Bridge / Viaduct of Railway / Metro Railway / ROB for a minimum value of Rs. 11.50 Cr. **And**	Must meet requirement	Existing JV - Must meet requirement. Or Lead Member of proposed JV- Must meet requirement	The tenderer shall submit the completion certificates / certified completion certificates from the client(s) and or Photostat of original certificates of client. All documents either original or photocopy should be attested by Notary.

(ii) The tenderer / JV firm or any Member of JV firm must have satisfactorily completed in last three previous financial years and the current financial year upto the date of submission of tender, at least one single work having a component of fabrication and erection of Open Web /Bow String Girder/ Plate Steel Girder for Railway / Metro Railway / Road Bridge. **Note:** The single work can be a separate work or same as (i) above.	Must meet requirement	Existing JV - Must meet requirement. Or Any Member of proposed JV- Must meet requirement	The tenderer shall submit the completion certificates / certified completion certificates from the client(s) and or Photostat of original certificates of client. All documents either original or photocopy should be attested by Notary.

Note: 1. Value of completed work done by a member in an earlier JV Firm shall be reckoned only to the extent of the concerned member's share in that JV firm for the purpose of satisfying his / her compliance to the above-mentioned technical eligibility criteria in the tender under consideration.

2. In case the tenderer/s is a partnership firm, the work experience shall be in the name of partnership firm only.

(B): Financial Eligibility Criteria

Criteria	**Compliance Requirement**		**Documents**
Requirement	**Single Entity**	**Joint Venture**	**Submission Requirements**

The contractual payments received by the tenderer / JV firm or the arithmetic sum of contractual payments received by all the members of the JV firm in the previous three financial year and the current financial year up to the date of submission of tender shall be at least **150% of advertised value of tender.**	Must meet Requirement	Must meet requirement	TDS certificates/ Audited balance sheets and or Photostat of TDS certificates/Audited Balance sheets clearly indicating the contractual amount received. All documents either original or photocopy should be attested by Notary.

Note: 1. Contractual payments received by a Member in an earlier JV firm shall be reckoned only to extent of the concerned member's share in that JV Firm for the purpose of satisfying compliance of the above-mentioned financial eligibility criteria in tender for considerations.

2. In case the tenderer/s is a partnership firm, the turnover etc. shall be in the name of partnership firm only.

1.3.13 (ii) Credentials of Tenderer

The tenderer shall provide satisfactory evidence in support of their technical and financial eligibility, which are acceptable to DFCCIL, as follows:

(a) For Technical eligibility criteria, the details will be submitted in Form No. 2A along with supporting documents.

(b) For Financial eligibility criteria, the details will be submitted in Form No. 2B along with supporting documents.

(c) The tenderer shall submit the completion certificates/certified completion certificates from the client(s) or Photostat of original certificates of client. All documents either original or photocopy should be attested by Notary. These certificates should indicate the details of works carried out and successful commissioning of similar type of work executed by the tenderer. Completion certificate from Govt. organisation/PSUs/Public Limited Company will be accepted. The certificate from Private individual/Private Company for whom such works are executed shall not be accepted. In case, the work is executed for Public Limited Company, copy of work order, bill of Quantity, TDS certificate payments received and copy of final/last bill paid by client shall be submitted.

(d) The DFCCIL reserves the right to verify all statements, information and documents submitted by the bidder in his tender offer, and the bidder shall, when so required by the DFCCIL, make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification, by the DFCCIL shall not relieve the bidder of its obligations or liabilities hereunder nor will it affect any right of the DFCCIL thereunder.

(e) For this tenders, it has been decided to adopt the affidavit-based system of credential verification as per Form No. 21. The tenderer shall submit along with the tender document, documents in support of his/their claim to fulfill the eligibility criteria as mentioned in the tender document. Each page of the copy of documents/certificates in support of certificates submitted by the tenderer shall be self–attested/ digitally signed by the tenderer or authorized representative of the tendering firm. Self –attestation shall include signature, stamp and date (on each page).

The following will be applicable for evaluating the eligibility:

(i) Similar nature of work physically completed within the qualifying period, i.e. last three financial year and current financial year (even though the work might have commenced before the qualifying period) shall only be considered in evaluating the eligibility.

(ii) The total value of similar nature of work completed during the qualifying period and not the payment received within qualifying period alone, shall be considered. In case, the final bill of similar nature of work has not been passed and final measurements have not been recorded, the paid amount including statutory deductions is to be considered. If final measurements have been recorded and work has been completed with negative variation, then also the paid amount including statutory deductions is to be considered.

However, if final measurements have been recorded and work has been completed with positive variation but variation has not been sanctioned, original contract agreement value or last sanctioned contract agreement value whichever is lower, shall be considered for judging eligibility.

(iii) As proof of sufficient financial capacity, contractor should have received total payments against satisfactory execution of all completed /on-going works of all types (not confined to only similar works) during the last three financial years and in the current financial year (up to the date of submission of the tender) of a value not less than 150% of advertised tender value.

(iv) Tenderer shall submit a statement of contractual payments received during last three financial years and current financial year on the prescribed Performa as per Form No. 2B. The details shall be based on the form 16-A issued by

the employer i.e. the certificate of deduction of tax at source as per Income Tax Act 1961. The photocopies of Form 16-A shall be enclosed duly attested by Notary Public with seal and Notarial Stamp thereon or a certificate from auditor or audited balance sheet certified by Chartered Accountant clearly indicating the contractual amount received duly attested by Notary Public with seal and Notarial Stamp thereon.

(v) The tenderer shall be considered disqualified/in-eligible if:

(a) The Tenderer or any of its partners and/or subcontractors included in the tender has been banned for business with Ministry of Railways/DFCCIL along with any of its attached and subordinate offices through an order issued by Ministry of Railways as per list available on Web site (http://www.indianrailways.gov.in/railwayboard) of Railway Board pertaining to banning of Business, with the banning being valid as on the date of submission the Tender.

(b) The Tenderer or any of its partners has suffered bankruptcy / insolvency or it is in the process of winding-up or there is a case of insolvency pending before any Court on the deadline of submission of application.

(vi) For the purposes of conversion of foreign currency to Indian rupees (INR) Bank Currency (BC) selling exchange rates as published by State Bank of India on the date 28 days prior to date of submission of tender shall be used. For few of the currencies where BC selling rates are not published by SBI or reserve bank of India, the exchange rate may be obtained from website- http://www.oanda.com/currency/historical-rates or http://www.xe.com.

(vii) For the purpose of evaluation of proposals, all values given in INR in eligible qualification criteria and the values provided by the applicants in the proposal in the currencies other than INR shall be converted into one i.e. INR as per exchange rate mentioned in para (vi) above.

1.3.14 Period of Completion

The entire work is required to be completed in all respects within 18 months (Eighteen months) from the date of issue of the acceptance letter. Time is the essence of contract. The contractor shall be required to maintain steady and regular progress to the satisfaction of the Engineer to ensure that the work will be completed in all respects within the stipulated time.

1.3.15 Deleted.

1.3.16 If the Tenderer/s deliberately gives any wrong information about credentials /

documents in his/their tenders and thereby create(s) circumstances for acceptance of his/their tender, DFCCIL reserves the right to reject such tender at any stage, besides, shall suspend business with such tenderer. The EMD of such tenderers shall also be forfeited.

1.3.17 Deleted.

1.3.18 Quantum of work and materials:

The indicative schedule of quantities of various items of works is included in Form - 4 of the tender documents.

1.3.19 Employer not bound to accept any tender:

The employer shall not be bound to accept the lowest or any tender or to assign any reason for non-acceptance or rejection of a tender. The employer reserves the right to accept any tender in respect of the whole or any portion of the work specified in the tender papers or to reduce the work or to accept any tender for less than the tendered quantities without assigning any reason whatsoever.

1.3.20 Schedule of Prices

The Schedule-1 of the tender document lists out the Schedule of Prices for various items. Based on these, the total tender value has also been worked out.

1.3.21 Performance Guarantee: Refer relevant clause of GCC.

1.3.22 The tenderer shall furnish information for making payment through ECS/ NEFT / RTGS (Tender Form No. 8 placed at Part IV of the tender documents).

1.3.23 Negotiation:

Should DFCCIL decide to negotiate with a view to bring down the rates, the tenderer called for negotiations should furnish the following form of declaration before commencement of negotiations?

"I..... do declare that in the event of failure of contemplated negotiations relating to Tender No..... dated .....my original tender shall remain open for acceptance on its original terms and conditions,".

1.3.24 Site Inspection:

Tenderers are requested to inspect the site and carry out careful examination to satisfy them as to the nature of work involved and facilities available at the site. They should note carefully all the existing structures and those under construction through other agencies. They should also study the suitability of utilizing the different equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of

locating their store yard, laboratory, staff quarters etc., and satisfy themselves with regard to the feasibility of transporting the girders, etc. from the yard to the final site of placement etc.

1.3.25 Deleted**.**

1.3.26 Priority of Documents

The several documents forming the contract are to be taken as mutually explanatory as one another. If any inconsistency or discrepancy is found in the documents the Client/Employer shall issue any necessary Clarification or instruction. For the purpose of interpretation, the priority of documents shall be in accordance with the following sequence.

1. The Contract agreement (if completed).
2. The Letter of Award.
3. Letter of Invitation, if any.
4. Terms of Reference (TOR)/ General Instruction to Tenderer.
5. The Schedules.
6. Special Conditions of Contract (SCC).
7. General Conditions of Contract (GCC).
8. Any other documents forming part of Contract.

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GENERAL CONDITIONS OF CONTRACT

PART - I
CHAPTER - IV

GENERAL CONDITIONS OF CONTRACT

DEFINITIONS AND INTERPRETATION

1. (1) Definition: - In these General conditions of Contract, the following terms shall have the meaning assigned hereunder except where the context otherwise requires: -

(a) "Railway" shall mean the President of the Republic of India or the Administrative Officers of the DFCCIL or of the Successor DFCCIL authorized to deal with any matters which these presents are concerned on his behalf.

(b) "General Manager of Railway" shall mean the officer - in-charge of the General Superintendence and Control of the Railway and shall mean and include their successors, of the successor Railway and shall also include Managing Director of DFCCIL.

(c) "Chief Engineer" shall mean the officer - in-charge of the Engineering Department of Railway and shall also include Chief Engineer (Construction), Chief Signal and Telecommunication Engineer, Chief Signal and Telecommunication Engineer (Construction), Chief Electrical Engineer, Chief Electrical Engineer (Construction) and shall also include CGM/GM of DFCCIL.

(d) "Divisional Railway Manager" shall mean the Officer in-charge of a Division of the Railway and shall also mean any officer nominated by Managing Director / DFCCIL and shall mean and include their successors of the successor Railway.

(e) "Engineer" and Employer's Engineer shall mean the Chief General Manager/ General Manager/ Chief Project Manager of DFCCIL / PMC appointed by DFCCIL.

(f) "Engineer's Representative" shall mean the Assistant Engineer, Assistant Signal and Telecommunication Engineer and Assistant Electrical Engineer, APM/ DPM / PM / Dy.CPM / Add. CPM of DFCCIL in direct charge of the work and shall include any Executive / Sr. Executive of DFCCIL of Civil Engineering / Signal & Telecommunication Engineering / Electrical Engineering Department appointed by the DFCCIL and shall mean and include the Engineer's Representative of the successor DFCCIL.

(g) "Contractor" shall mean the person / Firm / Company / JV whether incorporated or not who enters into the contract with the DFCCIL and shall include their executors, administrators, and successors and permitted assigns.

(h) "Contract" shall mean and include the Agreement of Work Order, the accepted

schedule of rates of the Schedule or Rates of DFCCIL modified by the tender percentage for items of work quantified, or not quantified, General Conditions of Contract, Special Conditions of Contracts, if any, Drawings, Specifications, Additional / Special Specifications, if any and tender forms, if any, and all other documents included as part of contract.

(i) "Works" shall mean the works to be executed in accordance with the contract.

(j) "Specifications" shall mean the Specifications for materials and works referred / mentioned in tender documents.

(k) "Schedule of rates of Railway" shall mean the schedule of rates issued under the authority of the Chief Engineer from time to time and shall also include Rates specified in tender document.

(l) "Drawing" shall mean the maps, drawings, plans and tracings or prints there of annexed to the contract and shall include any modifications of such drawings and further drawings as may be issued by the Engineer from time to time.

(m) "Constructional Plan" shall mean all appliances or things of whatsoever nature required for the execution, completion or maintenance of the works or temporary works (as hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.

(n) "Temporary Works" shall mean all temporary works of every kind required for the execution completion and/or maintenance of the works.

(o) "Site" shall mean the lands and other places on, under, in or through which the works are to be carried out and any other lands or places provided by the Railway for the purpose of the contract.

(p) "Period of Maintenance" shall mean the defect liability period from the date of completion of the works as certified by the Engineer.

(q) "Contractor's authorized engineer" shall mean a graduate engineer having more than 3 years experience in the relevant field of construction work involved in the contract, duly approved by PM/Dy. CPM/General Manager/Chief General Manager.

1.(2) **Singular and Plural**: - Words importing the singular number shall also include the plural and vice versa where the context requires.

1.(3) **Headings & marginal headings: -**The headings and marginal headings in these general conditions are solely for the purpose of facilitating reference and shall not

be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or the contract.

GENERAL OBLIGATION

2. (1) **Execution Co-relation and intent of contract Documents: -**The contract documents shall be signed in triplicate by the DFCCIL and the Contractor. The contract documents are complementary, and what is called for by any one shall be as binding as if called for by all, the intention of the documents is to include all labour and materials, equipments and transportation necessary for the proper execution of work. Materials or work not covered by or properly inferable from any heading or class of the specifications shall not be supplied by the DFCCIL to the contractors unless distinctly specified in the contract documents. Materials or works described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized standards.

2.(2) If a work is transferred from the jurisdiction of one Railway to another Railway or to a Project Authority/ DFCCIL or vice versa while contract is in subsistence, the contract shall be binding on the Contractor and the Successor Railway/Project in the same manner & take effect all respects as if the Contractor and the Successor Project were parties there to from the inception and the corresponding officer or the Competent Authority in the Successor Railway/Project will exercise the same powers and enjoy the same authority as conferred to the Predecessor Railway/Project under the original contract/agreement entered into.

2.(3) If for administrative or other reasons the contract is transferred to the Successor Railway/Successor Project Authority of DFCCIL the contract shall not withstanding any things contained herein contrary there to, be binding on the Contractor and the Successor Railway /Project Authority/ DFCCIL in the same manner and take effect in all respect as if the Contractor and the Successor Railway/ successor Project Authority of DFCCIL had been parties thereto from the date of this contract. The contract shall be Administered/Managed by GGM/GM/CPM/CGM nominated by DFCCIL.

3.(1) **Law governing the contract: -**The contract shall be governed by the law for the time being in force in the Republic of India.

3.(2) **Compliance to regulations and bye-laws:-**The contractor shall conform to the provision of any statute relating to the works and regulations and by-laws of any location authority and of any water and lighting companies or undertakings, with whose system the work is proposed to be connected and shall before making any variation from the drawings or the specifications that may be necessitated by so confirming give to the Engineer notice specifying the variation proposed to be made and the reasons for making the variation and shall not carry out such variation until he has received instructions from the Engineer in respect thereof. The contractor shall be bound to give all notices required by statute, regulations

or bye-laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

4. **Communications to be in writing: -** All notices, communications, reference and complaints made by the DFCCIL or the Engineer or the Engineer's representative or the contractor inters concerning the work shall be in writing and no notice, communication, reference or complaint not in writing shall be recognized.

5. **Service of Notices on Contractors:-**The contractor shall furnish to the Engineer the name designation and address of his authorized agent and all complaints, notices, communications and references shall be deemed to have been duly given to the contractor if delivered to the contractor or his authorized agent or left at or posted to the address so given and shall be deemed to have been so given in the case of posting on day on which they would have reached such address in the ordinary course of post or on the day on which they were so delivered or left. In the case of contract by partners, any change in the constitution of the firm shall be forthwith notified by the contractor to the Engineer.

6. **Occupation and use of land: -** No land belonging to or in the possession of the Railway/DFCCIL shall be occupied by the Contractor without the permission of the Railway/DFCCIL. The Contractor shall not use, or allow to be used; the site for any purposes other than that of executing the works. Whenever non-railway bodies/persons are permitted to use railway premises with competent authority's approval, conservancy charges as applicable from time to time may be levied.

7. **Assignment or subletting of contract: -** The contractor shall not assign or sublet the contract or any part thereof or allow any person to become interested therein any manner whatsoever without the special permission in writing of the DFCCIL. Any breach of this condition shall entitle the DFCCIL to rescind the contract under clause 62 of these conditions and also render the contractor liable for payment to the DFCCIL in respect of any loss or damage arising or ensuing from such cancellation. Provided always that execution of the details of the work by petty contractor under the direct and personal supervision of the Contractor or his agent shall not be deemed to be sub-letting under this clause. The permitted subletting of work by the contractor shall not establish any contractual relationship between the sub- contractor and the DFCCIL and shall not relieve the contractor of any responsibility under the contract.

8. **Assistance by the DFCCIL for the Stores to be obtained by the Contractor: -** Owing to difficulty in obtaining certain materials (including Tools & Plant) in the market, the DFCCIL may have agreed without any liability therefore to endeavour to obtain or assist the contractor in obtaining the required quantities of such materials as may be specified in the tender. In the event of delay or failure in

obtaining the required quantities of the aforesaid material the contractor shall not be deemed absolved of his own responsibility and shall keep in touch with day to day positions regarding their availability and accordingly adjust progress of works including employment of labour and the DFCCIL shall not in any way be liable for the supply of materials or for the non-supply thereof for any reasons whatsoever nor for any lossor damage arising in consequence of such delay or no supply.

9. Deleted.

10. **Carriage of materials: -** No forwarding orders shall be issued by the DFCCIL for the conveyance of contractor's materials, tools and plant by Rail which may be required for use in the works and the contractor shall pay full freight charges at public tariff rates therefore.

11. **Deleted.**

12. Representation on Works: - The contractor shall, when he is not personally present on the site of the works place and keep a responsible agent at the works during working hours who shall on receiving reasonable notice, present himself to the Engineer and orders given by the Engineer or the engineer's representative to the agent shall be deemed to have the same force as if they had been given to the Contractor. Before absenting himself, the contractor shall furnish the name and address of his agent for the purpose of this clause and failure on the part of the Contractor to comply with this provision at any time will entitle the DFCCIL to rescind the contract under clause 62 of these conditions.

13. **Relics and Treasures: -** All gold, silver, oil and other minerals of any description and all precious stones, coins, treasures relics antiquities and other similar things which shall be found in or upon the site shall be the property of the DFCCIL and the Contractor shall duly preserve the same to the satisfaction of the DFCCIL and shall from time to time deliver the same to such person or persons as the DFCCIL may appoint to receive the same.

14. Excavated material:-The contractor shall not sell or otherwise dispose of or remove except for the purpose of this contract, the sand, stones, clay, ballast, earth, rock or other substances or materials which may be obtained from any excavation made for the purpose of the works or any building or produced upon the site at the time of delivery of the possession thereof but all the substances, materials, buildings and produce shall be the property of the DFCCIL provided that the contractor may, with the permission of the Engineer, use the same for the purpose of the works either free of cost or pay the cost of the same at such rates as may be determined by the Engineer.

15. Indemnity by Contractors: - The contractor shall indemnify and save harmless

the Railway/DFCCIL from and against all actions, suit proceedings losses, costs, damages, charges, claims and demands of every nature and description brought or recovered against the Railways/DFCCIL by reason of any act or omission of the contractor, his agents or employees, in the execution of the works or in his guarding of the same. All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

16.(1) Security Deposit: - The earnest money deposited by the contractor with this tender will be retained by the DFCCIL as part of security for the due and faithful fulfilment of the contract by the contractor. The balance to make up the security deposit, the rates for which are given below, may be deposited by the contractor in cash or may be recovered by percentage deduction from the contractor's "on account" bills. Provided also that in case of defaulting contractor the DFCCIL may retain any amount due for payment to the contractor on the pending "on account bills" so that the amounts so retained may not exceed 5% of the total value of the contract.

16.(2) Recovery of Security Deposit: - Unless otherwise specified in the special conditions, if any, the Security Deposit / rate of recovery / mode of recovery shall be as under:

(a) Security Deposit for each work should be 5% of the contract value.

(b) The rate of recovery should be at the rate of 10% of the bill amount till the full security deposit is recovered.

(c) Security Deposits will be recovered only from the running bills of the contract and no other mode of collecting SD such as SD in the form of instruments like BG (except Note (ii) below); FD etc. shall be accepted towards Security Deposit.

Security deposit shall be returned to the contractor after the expiry of the Defect Liability Period in all the cases other than Note (i) mentioned below and after passing the final bill based on No Claim Certificate with the approval of the Competent Authority. The Competent Authority shall normally be the authority who is competent to sign the contract. If this competent authority is of the rank lower than JA grade / CPM, DFCCIL, then JA grade officer / CPM, DFCCIL (Concerned with the work) should issue the certificate. The certificate, inter alia, should mention that the work has been completed in all respects and that all the contractual obligations have been fulfilled by the contractor and that there is no due from the contractor to Railways/DFCCIL against the contract concerned. Before releasing the SD, an unconditional and unequivocal no claim certificate from the contractor concerned should be obtained.

Note:

(i) After the work is physically completed, security deposit recovered from the running bills of a contractor can be returned to him if he so desires, in lieu of FDR / irrevocable Bank Guarantee for equivalent amount to be submitted by him.

(ii) In case of contracts of value Rs.50 crores and above, irrevocable Bank Guarantee can also be accepted as a mode of obtaining security deposit.

16.(3) No interest will be payable upon the Earnest Money and Security Deposit or amounts payable to the contractor under the contract, but Government Securities deposited in terms of Sub-clause (1) of this clause will be payable with interest accrued thereon.

16.(4) Performance Guarantee(P.G.)

The procedure for obtaining Performance Guarantee is outlined below:

(a) The successful bidder shall have to submit a Performance Guarantee (PG) within 30 (thirty) days from the date of issue of Letter of Acceptance (LOA). Extension of time for submission of PG beyond 30 (thirty) days and upto 60 days from the date of issue of LOA may be given by the Authority who is competent to sign the contract agreement. However, a penal interest of 15% per annum shall be charged for the delay beyond 30 (thirty) days, i.e. from 31st day after the date of issue of LOA. In case the contractor fails to submit the requisite PG even after 60 days from the date of issue of LOA, the contract may be terminated duly forfeiting EMD and other dues, if any payable against that contract. The failed contractor shall be debarred from participating in re-tender for that work.

(b) The successful bidder shall submit the performance Guarantee in any of the following forms amounting to 5% of the contract value: -

(i) Irrevocable Bank Guarantee issued by any of the Nationalized/Scheduled Banks of India.

(ii) Fixed Deposit receipts, pay orders, Demand Drafts and Guarantee Bonds from any of the Nationalized/Scheduled Banks of India.

Note: The instruments as listed above will also be acceptable for Guarantees in case of Mobilization advance.

(c) The performance Guarantee shall be submitted by the successful bidder after the letter of acceptance has been issued, but before signing of the contract agreement. The agreement should normally be signed within 30 (thirty) days after the issue of LOA and the Performance Guarantee shall also be submitted within this time limit. This P. G. shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case, the time limit for completion of work gets extended, the contractor shall get the validity of Performance Guarantee extended to cover such extended time for completion of work plus 60 days.

(d) The value of PG to be submitted by the contractor will not change for variation up to 25 % (either increase or decrease). In case during the course of execution, value of the contract increases by more than 25 % of the original contract value, an additional performance guarantee amounting to 5 % (five percent) for the excess value over the original contract value shall be deposited by the contractor. On the other hand, if the value of contract decreases by more than 25% of the original contract, Performance Guarantee amounting to 5 % (five percent of the decrease in contract value shall be returned to the contractor. The PG amount in excess of required PG for the decreased contract value, available with railways shall be returned to contractor as per their request duly safeguarding the interest of railways/DFCCIL.

(e) The performance Guarantee (PG) shall be released after the physical completion of the work based on the 'completion certificate' issued by the competent authority stating that the contractor has completed the work in all respects satisfactorily. The security deposit shall, however, be released only after the expiry of the defect liability period and after passing the final bill based on 'No Claim Certificate' from the contractor.

(f) Whenever the contract is rescinded, the security deposit shall be forfeited and the Performance Guarantee shall be encashed. The balance work shall be got done independently without risk and cost of the failed contractor, the failed contractor shall be debarred from participating in the tender for executing the balance work. If the failed contractor is a JV or a partnership firm, then every member / partner of such a firm shall be debarred from participating in the tender for the balance work in his / her individual capacity or as a partner of any other JV / partnership firm.

(g) The Engineer shall not make a claim under the Performance Guarantee except for amounts to which the President of India / DFCCIL is entitled under the contract (no withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

(i) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer may claim the full amount of the Performance Guarantee.

(ii) Failure by the contractor to pay President of India / DFCCIL any amount due, either as agreed by the contractor or determined under any of the Clauses/conditions of the agreement, within 30 days of the service of the notice to the effect by Engineer.

(iii) The contract being determined or rescinded under provision of the GCC the Performance Guarantee shall be forfeited in full and shall be absolutely at the disposal of the President of India/DFCCIL.

17. Force Majeure Clause:- If at any time, during the continuance of this contract, the Performance in whole or in part by either party of any obligation under this contract shall be prevented or delayed by reason of any war, hostility, acts of public enemy, civil commotion, sabotage, serious loss or damage by fire, explosions, epidemics, strikes, lockouts or act of God (hereinafter, referred to events) provided, notice of the happening of any such event is given by either party to the other within 30 days from the date of occurrence thereof, neither party shall by reason of such event, be entitled to terminate this contract nor shall either party have any claim for damages against the other in respect of such non- performance of delay in performance, and works under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist, and the decision of the Engineer as to whether the works have been so resumed or not shall be final and conclusive, PROVIDED FURTHER that if the performance in whole or in part of any obligation under this contract is prevented or delayed by reason of any such event for a period exceeding 120 days, either party may at its option terminate the contract by giving notice to the other party.

17-A Extension of time in Contracts: - Subject to any requirement in the contract as to completion of any portion or portions of the works before completion of the whole, the contractor shall fully and finally complete the whole of the works comprised in the contract (with such modifications as may be directed under conditions of this contract) by the date entered in the contract or extended date in terms of the following clauses: -

(i) **Extension due to modification**:- If any modifications have been ordered which in the opinion of the Engineer have materially increased the magnitude of the work, then such extension of the contracted date of completion may be granted as shall appear to the Engineer to be reasonable in the circumstances, provided moreover that the Contractor shall be responsible for requesting such extension of the date as may be considered necessary as soon as the cause thereof shall arise and in any case not less than one month before the expiry of the date fixed for completion of the works.

(ii) **Extension for delay not due to DFCCIL or Contractor**:-If in the opinion of the Engineer the progress of work has any time been delayed by any act or neglect of Railways/DFCCIL's employees or by other contractor employed by the DFCCIL under sub-clause (4) of clause 20 of these conditions or in executing the work not forming part of the contract but on which contractor's performance necessarily depends or by reasons of proceeding taken or threatened by or dispute with adjoining or to neighbouring owners or public authority arising otherwise through the Contractor's own default etc. or by the delay authorized by the Engineer pending arbitration or in consequences of the contractor not having received in due time necessary instructions from the DFCCIL for which he shall

have specially applied in writing to the Engineer or his authorized representative then upon happening of any such event causing delay, the contractor shall immediately give notice thereof in writing to the Engineer within 15 days of such happening but shall nevertheless make constantly his best endeavours to bring down or make good the delay and shall do all that may be reasonably required of him to the satisfaction of the Engineer to proceed with the works. The contractor may also indicate the period for which the work is likely to be delayed and shall be bound to ask for necessary extension of time. The Engineer on receipt of such request from the contractor shall consider the same and shall grant such extension of time as in his opinion is reasonable having regard to the nature and period of delay and the type and quantum of work affected thereby.

No other compensation shall be payable for works so carried forward to the extended period of time, the same rates, terms and conditions of contract being applicable as if such extended period of time was originally provided in the original contract itself.

(iii) **Extension for delay due to Railways / DFCCIL:-** In the event of any failure or delay by the Railway / DFCCIL to hand over the Contractor possession of the lands necessary for the execution of the works or to give the necessary notice to commence the works or to provide the necessary drawings or instructions or any other delay caused by the DFCCIL due to any other cause whatsoever, then such failure or delay shall in no way affect or vitiate the contract or alter the character thereof or entitle the contractor to damages or compensation therefore, but in any such case, the DFCCIL may grant such extension or extensions of the completion date as may be considered reasonable.

17-B **Extension of time for delay due to contractor: -** The time for the execution of the work or part of the works specified in the contract documents shall be deemed to be the essence of the contract and the works must be completed not later than the date(s) as specified in the contract. If the contractor fails to complete the works within the time as specified in the contract for the reasons other than the reasons specified in clause 17 and 17-A, the DFCCIL may, if satisfied that the works can be completed by the contractor within reasonable short time thereafter, allow the contractor for further extension of (Performa at Form No. 14) time as the Engineer may decide. On such extension the DFCCIL will be entitled without prejudice to any other right and remedy available on that behalf, to recover from the contractor as agreed damages and not by way of penalty a sum equivalent to ½ of 1% of the contract value of the works for each week or part of the week.

For the purpose of this clause, the contract value of the works shall be taken as value of work as per contract agreement including any supplementary work order/contract agreement issued. Provided also, that the total amount of liquidated damages under this condition, shall not exceed the under noted percentage value or of the total value of the item or groups of items of work for which a separate

distinct completion period is specified in the contract.

(i) For contract value up to Rs. 2 lakhs - 10% of the total value of the contract
(ii) For contracts valued above Rs. 2 lakhs- 10% of the first Rs.2 lakhs and 5% of the balance

Further competent authority while granting extension to the currency of contract under clause 17. (B) of GCC may also consider levy of token penalty as deemed fit based on the merit of the case. Provided further, that if the DFCCIL is not satisfied that the works can be completed by the Contractor and in the event of failure on the part of the contractor to complete the work within further extension of time allowed as aforesaid, the DFCCIL shall be entitled without prejudice to any other right or remedy available in that behalf, to appropriate the contractor's security deposit and rescind the contract under clause 62 of these conditions, whether or not actual damage is caused by such default.

18.(1) **Illegal Gratification:-** Any bribe, commission, gift or advantage given, promised or offered by or on behalf to the contractor or his partner, agent or servant or, anyone on his behalf, to any officer or employee of the DFCCIL, or to any person on his behalf in relation to obtaining or execution of this or any other contract with the DFCCIL shall, in addition to any criminal liability which he may incur, subject contractor to the rescission of the contract and all other contracts with the DFCCIL and to the payment of any loss or damage resulting from such decision and the DFCCIL shall be entitled to deduct the amounts so payable from any moneys due to the Contractor(s) under this contract or any other contracts with the DFCCIL.

18.(2) The contractor shall not lend or borrow from or have or enter into any monitory dealings and transactions either directly or indirectly with any employee of the DFCCIL and if he shall do so, the DFCCIL shall be entitled forthwith to rescind the contract and all other contracts with the DFCCIL. Any question or dispute as to the commission or any such offence or compensation payable to the DFCCIL under this clause shall be settled by the GM/CO/MEERUT of the DFCCIL, in such a manner as he shall consider fit and sufficient and his decision shall be final and conclusive. In the event of rescission of the contract under this clause, the contractor will not be paid any compensation whatsoever except payments for the work done up to the date of rescission.

EXECUTION OF WORKS

19.(1) **Contractor's understanding:-** It is understood and agreed that the contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the progress of the works, the general and local conditions, the labour conditions prevailing therein and all other matters which can

in any way affect the works under the contract.

19.(2) Commencement of works: -The contractor shall commence the works within 15 days after the receipt by him of an order in writing to this affect from the Engineer and shall proceed with the same with due expedition and without delay.

19.(3) Accepted Programme of work: - The contractor who has been awarded the work shall as soon as possible but not later than 30 days after the date of receipt of the acceptance letter in respect of contracts with initial completion period of one and half years or less or not later than 90 days for other contracts have to submit the detailed programme of work indicating the time schedule of various items of works in the form of Bar Chart/PERT/CPM. He shall also submit the details of organization (in terms of labour and supervisors) plant and machinery, that he intends to utilize (from time to time) for execution of the work within stipulated date of completion. The programme of work amended as necessary by discussions with the Engineer, shall be treated as the agreed programme of the work for the purpose of this contract and the contractor shall endeavour to fulfill this programme of work. The progress of work will be watched accordingly and the liquidated damages will be with reference to the overall completion date. Nothing stated herein shall preclude the contractor in achieving earlier completion of item or whole of the works than indicated in the programme.

19.(4) Setting out of works: - The contractor shall be responsible for the correct setting out of all works in relation to original points, lines and levels of reference at his cost. The contractor shall execute the work true to alignment, grade, levels and dimensions as shown in the drawing and as directed by the Engineer's representative and shall check these at frequent intervals. The contractor shall provide all facilities like labour and instruments and shall co- operate with the Engineer's representative to check all alignment, grades, levels and dimensions. If, at any time, during the progress of the works any error shall appear or arise in any part of the work, the contractor, on being required so to do by the Engineer's representative shall, at his own cost rectify such errors, to the satisfaction of the Engineer's representative. Such checking shall not absolve the contractor of his own responsibility of maintaining accuracy in the work. The contractor shall carefully protect and preserve all bench marks, sight rails, pegs and other things used in setting out the work.

20.(1) Compliance to Engineer's instructions: -The Engineer shall direct the order in which the several parts of the works shall be executed and the contractor shall execute without delay all orders given by the Engineer from time to time but the contractor shall not be relieved thereby from responsibility for the due performance of the works in all respects.

20.(2) Alterations to be authorized: -No alterations in or additions to or omissions or abandonment of any part of the works shall be deemed authorized, except under instructions from the Engineer, and the contractor shall be responsible to

obtain such instructions in each and every case in writing from the Engineer.

20.(3) **Extra works: -** Should works over and above those included in the contract require to be executed at the site, the contractor shall have no right to be entrusted with the execution of such works which may be carried out by another contractor or contractors or by other means at the option of the DFCCIL.

20.(4) **Separate contracts in connection with works: -** The DFCCIL shall have the right to let other contracts in connection with the works. The contractor shall afford other contractors reasonable opportunity for the storage of their materials and the execution of their works and shall properly connect and coordinate his work with theirs. If any part of the contractor's work depends for proper execution or result upon the work of another contractor(s), the contractor shall inspect and promptly report to the Engineer any defects in such works that render it unsuitable for such proper execution and results. The contractor's failure so-to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the other contractor's work after the execution of his work.

21. **Instruction of Engineer's Representative: -** Any instructions or approval given by the Engineer's representative to contractor in connection with the works shall bind the contractor as though it had been given by the Engineer provided always as follows.

(a) Failure of the Engineer's representative to disapprove any work or materials shall not prejudice, the power of the Engineer thereafter to disapprove such work or material and to order the removal or breaking up thereof.

(b) If the Contractor shall be dissatisfied by reason of any decision of the Engineer's representative, he shall be entitled to refer the matter to the Engineer who shall there upon confirm or vary such decision.

22.(1) **Adherence to specifications and drawings**: - The whole of the works shall be executed in perfect conformity with the specifications and drawings of the contract. If contractor performs any works in a manner contrary to the specifications or drawings or any of them and without such reference to the Engineer, he shall bear all the costs arising or ensuing therefore and shall be responsible for all loss to the DFCCIL.

22.(2) **Drawings and specifications of the works: -** The contractor shall keep one copy of drawings and specifications at the site, in good order, and such contract documents as may be necessary available to the Engineer or the Engineer's representative.

22.(3) **Ownership of drawings and specifications: -** All drawings and specifications and copies thereof furnished by the DFCCIL to the Contractor are

deemed to be the property of the DFCCIL. They shall not be used on other works and with the exception of the signed contract set, shall be returned by the contractor to the DFCCIL on completion of the work or termination of the contract.

22.(4) Compliance with Contractor's request for details: - The Engineer shall furnish with reasonable promptness, after receipt by him of the contractor's request for the same, additional instructions by means of drawings or otherwise, necessary for the proper execution of the works or any part thereof. All such drawing and instructions shall be consistent with the contract Documents and reasonably inferable there from.

22.(5) Meaning and intent of specification and drawings:- If any ambiguity arises as to the meaning and intent of any portion of the specifications and drawings or as to execution or quality of any work or material, or as to the measurements of the works the decision of the Engineer thereon shall be final subject to the appeal (within 7 days of such decision being intimated to the contractor) to the Chief Engineer/ Chief General Manager / General Manager /ROB,/CPM who shall have the power to correct any errors, omissions, or discrepancies in aforementioned items and whose decision in the matter in dispute or doubt shall be final and conclusive.

23 Working during night: - The contractor shall not carry out any work between sun-set and sun-rise without the previous permission of the Engineer.

24. Damage to Railway / DFCCIL property or private life and property:-The contractor shall be responsible for all risk to the work and for trespass and shall make good at his own expense all loss or damage whether to the works themselves or to any other property of the Railway or the lives, persons or property of others from whatsoever cause in connection with the works until they are taken over by the Railway/ DFCCIL and this although all reasonable and proper precautions may have been taken by the contractor, and in case the Railway / DFCCIL shall be called upon to make good any costs, loss or damages, or to pay an compensation, including that payable under the provisions of the Workmen's Compensation Act or any statutory amendments thereof to any person or persons sustaining damages as aforesaid by reason of any act, or any negligence or omissions on the part of the contractor the amount of any costs or charges including costs and charges in connection with legal proceedings, which the Railway / DFCCIL may incur in reference thereto, shall be charged to the contractor. The Railway / DFCCIL shall have the power and right to pay or to defend or compromise any claim of threatened legal proceedings or in anticipation of legal proceedings being instituted consequent on the action or default of the contractor, to take such steps as may be considered necessary or desirable to ward off or mitigate the effect of such proceedings, charging to contractor, as aforesaid any sum or sums of money which may be paid and any expenses

whether for reinstatement or otherwise which may be incurred and the propriety of any such payment, defence or compromise, and the incurring of any such expenses shall not be called in question by the contractor.

25. **Sheds, stores houses and Yards**:-The contractor shall at his own expense provide himself with sheds, stores houses and yards in such situations and in such numbers as in the opinion of the Engineer is requisite for carrying on the works and the contractor shall keep at each such sheds, stores houses and yard a sufficient quantity of materials and plant in stock as not to delay the carrying out of the works with due expedition and the Engineer and the Engineer's representative shall have free access to the said sheds, store houses and yards at any time for the purpose of inspecting the stock of materials or plant so kept in hand, and any materials or plan which the Engineer may object to shall not be brought upon or used in the works, but shall be forthwith removed from the sheds, store houses or yards by the contractor. The contractor shall at his own expenses provide and maintain suitable mortar mills, soaking vats or any other equipments necessary for the execution of the works.

26. Provision of efficient and competent Staff at work sites by the Contractor: -

26.1 The contractor shall place and keep on the works at all times efficient and competent staff to give the necessary directions to his workmen and to see that they execute their work in sound and proper manner and shall employ only such supervisors, workmen and labourers in or about the execution of any of these works as are careful and skilled in the various trades.

26.2 The contractor shall at once remove from the works any agents, permitted sub-contractor, supervisor, workman or labourer who shall be objected to by the Engineer and if and whenever required by the Engineer, he shall submit a correct return showing the names of all staff and workmen employed by him.

26.3 In the event of the Engineer being of the opinion that the contractor is not employing on the works a sufficient number of staff and workmen as is necessary for the proper completion of the works within the time prescribed, the contractor shall forthwith on receiving intimation to this effect deploy the additional number of staff and labour specified by the Engineer within seven days of being so required and failure on the part of the contractor to comply with such instructions will entitle the Railway to rescind the contract under clause 62 of these conditions.

26A. Deployment of Qualified Engineers at Work Sites by the Contractor: **-**

26A.1 The contractor shall also employ Qualified Graduate Engineer or Qualified Diploma Holder Engineer, based on value of contract, as may be prescribed by the Ministry of Railways through separate instructions from time to time.

26A.2 In case the contractor fails to employ the Engineer, as aforesaid in Para 26A.1, he shall be liable to pay penalty at the rates, as may be prescribed by the Ministry of Railways through separate instructions from time to time for the default period for the provisions, as contained in Para 26A.1.

26A.3 Deleted.

27.(1) Workmanship and testing:- The whole of the works and / or supply of materials specified and provided in the contract or that may be necessary to be done in order to form and complete any part thereof shall be executed in the best and most substantial workman like manner with materials of the best and most approved quality of their respective kinds, agreeable to the particulars contained in or implied by the specifications and as referred to in and represented by the drawings or in such other additional particulars, instructions and drawings may be found requisite to be given during the carrying on of the works and to the entire satisfaction of the Engineer according to the instructions and directions which the contractors may from time to time receive from the Engineer. The materials may be subjected to tests by means of such machines, instruments and appliances as the Engineer may direct and wholly at the expense of the contractor.

27.(2) Removal of improper work and materials: - The Engineer or the Engineer's Representative shall be entitled to order from time to time:

(a) The removal from the site within the time specified in the order of any materials which in his opinion are not in accordance with the specifications or drawings.

(b) the substitution of proper and suitable materials, and

(c) the removal and proper re-execution, notwithstanding any previous tests thereof or on account payments therefore, of any work which in respect of materials or workmanship; is not in his opinion in accordance with the specifications and in case of default on the part of the contractor in carrying out such order the DFCCIL shall be entitled to rescind the contract under clause 62 of these conditions.

28. Facilities for inspection:- The contractor shall afford the Engineer and the Engineer's Representative every facility for entering in and upon every portion of the work at all hours for the purpose of inspection or otherwise and shall provide all labour, materials, planks, ladders, pumps, appliances and things of every kind required for the purpose and the Engineer and the Engineer's Representative shall at all times have free access to every part of the works and to all places at which materials for the works are stored or being prepared.

29. Examination of work before covering up:- The contractor shall give 7 days' notice to the Engineer or the Engineer's representative whenever any work or

materials are intended to be covered up in the earth, in bodies or walls or otherwise to be placed beyond the reach of measurements in order that the work may be inspected or that correct dimensions may be taken before being so covered, placed beyond the reach of measurement in default whereof, the same shall at the option of the Engineer or the Engineer's representative be uncovered and measured at the contractor's expense or no allowance shall be made for such work or materials.

30. **Temporary Works: -** All temporary works necessary for the proper execution of the works shall be provided and maintained by the contractor and subject to the consent of the Engineer shall be removed by him at his expenses when they are no longer required and in such manner as the Engineer shall direct. In the event of failure on the part of the contractor to remove the temporary works, the Engineer will cause them to be removed and cost as increased by supervision and other incidental charges shall be recovered from the contractor. If temporary huts are provided by the contractor on the Railway / DFCCIL land for labour engaged by him for the execution of works, the contractor shall arrange for handing over vacant possession of the said land after the work is completed; if the contractor's labour refuse to vacate, and have to be rejected by the Railway / DFCCIL necessary expenses incurred by the Railway / DFCCIL in connection therewith shall be borne by the contractor.

31.(1) **Contractor to supply water for works: -** Unless otherwise provided in the contract, the contractor shall be responsible for the arrangements to obtain supply of water necessary for the works.

31.(2) Deleted.
31.(3) Deleted.

31.(4)(a) Contractor to arrange supply of Electric power for works: - Unless otherwise provided in the contract, the contractor shall be responsible for arrangements to obtain supply of electric power for the works.

31.(4)(b) Deleted.

32. **Property in materials and plant: -** The materials and plant brought by the Contractor upon the site or on the land occupied by the Contractor in connection with the works and intended to be used for the execution thereof shall immediately, they are brought upon the site of the said land, be deemed to be the property of the Railway / DFCCIL. Such of them as during the progress of the works are rejected by the Engineer under Clause 25 of these conditions or are declared by him not to be needed for the execution of the works or such as on the grant of the certificate of completion remain unused shall immediately on such rejection, declaration or grant cease to be deemed the property of the Railway / DFCCIL and the Contractor may then (but not before) remove them from the site

or the said land. This clause shall not in any way diminish the liability of the Contractor nor shall the Railway / DFCCIL be in any way answerable for any loss or damage which may happen to or in respect of any such materials or plant either by the same being lost, stolen, injured or destroyed by fire, tempest or otherwise.

33. (1) Tools, Plant and Materials Supplied by Railway / DFCCIL:- The Contractor shall take all reasonable care of all tools, plant and materials or other property whether or a like description or not belonging to the Railway/DFCCIL and committed to his charge for the purpose of the works and shall be responsible for all damage or loss caused by him, his agents, permitted subcontractor, or his workmen or others while they are in his charge. The Contractors shall sign accountable receipts for tools, plants and materials made over to him by the engineer and on completion of the works shall hand over the unused balance of the same to the Engineer in good order and repair, fair wear and tear excepted, and shall be responsible for any failure to account for the same or any damage done thereto.

33.(2) Hire of DFCCIL / Railway's Plant: - The Railway / DFCCIL may hire to the Contractor such plant as concrete mixers, compressors and portable engines for use during execution of the works on such terms as may be specified in the special conditions or in a separate agreement for Hire of Plant.

34.(1) Precaution during progress of works: - During the execution of works, unless otherwise specified, the Contractor shall at his own cost provide the materials for and execute all shoring, timbering and strutting works as is necessary for the stability and safety of all structures, excavations and works and shall ensure that no damage, injury or loss is caused or likely to be caused to any person or property.

34.(2) Roads and Water courses: - Existing roads or water courses shall not be blocked, cut through, altered, diverted or obstructed in any way by the Contractor, except with the permission of the Engineer. All compensations claimed for any unauthorized closure, cutting through, alterations, diversion or obstruction to such roads or water courses by the Contractor or his agent or his staff shall be recoverable from the Contractor by deduction from any sums which may become due to him in terms of contract, or otherwise according to law.

34.(3) Provision of access to premises:- During progress of work in any street or thoroughfare, the Contractor shall make adequate provision for the passage of traffic, for securing safe access to all premises approached from such street or thoroughfare and for any drainage, water supply or means of lighting which may be interrupted by reasons of the execution of the works and shall react and maintain at his own cost barriers, lights and other safeguards as prescribed by the Engineer, for the regulation of the traffic, and provide watchmen necessary to prevent accidents. The works shall in such cases be executed night and day if so ordered by the Engineer and with such vigour so that the traffic way be impeded

for as short a time as possible.

34.(4) Safety of Public: - The Contractor shall be responsible to take all precautions to ensure the safety of the public whether on public or DFCCIL/Railway property and shall post such look out men as may in the opinion of the Engineer be required to comply with regulations pertaining to the work.

35. Deleted.

36.(1) Suspension of works: - The Contractor shall on the order of the Engineer, suspend the progress of the works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension properly protect and secure the work so far as is necessary in the opinion of the Engineer. If such suspension is: -

(a) Provided for in the contract, or
(b) Necessary for the proper execution of the works or by the reason of weather conditions or by some default on the part of the Contractor, and/or
(c) Necessary for the safety of the works or any part thereof.

36.(2) The Contractor shall not be entitled to the extra costs, if any, incurred by him during the period of suspension of the works, but in the event of any suspension ordered by the Engineer for reasons other than aforementioned and when each such period of suspensions exceeds 14 days, the contractor shall be entitled to such extension of time for completion of the work as the Engineers may consider proper having regard to the period or periods of such suspensions and to such compensations as the Engineer may consider reasonable in respect of salaries or wages paid by the Contractor to his employees during the periods of such suspension.

36.(3) Suspension lasting more than 3 months:- If the progress of the works or any part thereof is suspended on the order of the Engineer for more than three months at a time, the Contractor may serve a written notice on the Engineer requiring permission within 15 days from the receipt thereof to proceed with the works or that part thereof in regard to which progress is suspended and if such permission is not granted within that time the Contractor by further written notice so served may, but is not bound to, elect to treat the suspension where it affects part only of the works as an omission of such part or where it affects the whole of the works, as an abandonment of the contract by the DFCCIL.

37. Rates for items of works:- The rates, entered in the accepted Schedule of Rates of the Contract are intended to provide for works duly and properly completed in accordance with the general and special (if any) conditions of the contract and the specifications and drawings together with such enlargements,

extensions, diminutions, reductions, alterations or additions as may be ordered in terms of Clause 42 of these conditions and without prejudice to the generality thereof and shall be deemed to include and cover superintendence and labour, supply, including full freight, of materials, stores, patterns, profiles, moulds, fittings, centring, scaffolding, shoring props, timber, machinery, barracks, tackle, roads, pegs, posts, tools and all apparatus and plant required on the works, except such tools, plant or materials as may be specified in the contract to be supplied to the Contractor by the DFCCIL, the erection, maintenance and removal of all temporary works and, buildings, all watching, lighting, bailing, pumping and draining, all prevention of or compensation for trespass, all barriers and arrangements for the safety of the public or of employees during the execution of works, all sanitary and medical arrangements for labour camps as may be prescribed by the DFCCIL, the setting of all work and of the construction, repair and upkeep of all centre lines, bench marks and level pegs thereon, site clearance, all fees duties, royalties, rent and compensation to owners for surface damage or taxes and impositions payable to local authorities in respect of land, structures and all material supplied for the work or other duties of expenses for which the Contractor may become liable or may be put to under any provision of law for the purpose of or in connection with the execution of the contract, and all such other incidental charges or contingencies as may have been specially provided for in the specifications.

38. Deleted.

39.(1) Rates for extra items of works:- Any type of work carried out by the Contractor on the instructions of the Engineer which is not included in the accepted schedules of rates shall be executed at the rates set forth in the "Schedule of Rates of Railway" modified by the tender percentage and such items are not contained in the latter, at the rate agreed upon between the Engineer and the Contractor before the execution of such items of work and the Contractors shall be bound to notify the Engineer at least seven days before the necessity arises for the execution of such items of works that the accepted schedule of rates does not include rate or rates for the extra work involved. The rates payable for such items shall be decided at the meeting to be held between the Engineer and Contractor, in as short a period as possible after the need for the special item has come to the notice. In case the Contractor fails to attend the meeting after being notified to do so or in the event of no settlement being arrived at, the DFCCIL shall be entitled to execute the extra works by other means and the Contractor shall have no claim for loss or damage that may result from such procedure.

39.(2) Provided that if the Contractor commences work or incurs any expenditure in regard thereto before the rates as determined and agreed upon as lastly hereunto fore-mentioned, then and in such a case the Contractor shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of determination of rates as aforesaid according to the rates as shall be fixed by the Engineer. However, if the Contractor is not satisfied with the decision of the Engineer in this respect he may appeal to the Chief Engineer/ Chief General

Manager/ General Manager / Chief Project Manager within 30 days of getting the decision of the Engineer, supported by analysis of the rates claimed. The Chief Engineer's/ Chief General Manager's / Chief Project Manager's decision after hearing both the parties in the matter would be final and binding on the Contractor and the DFCCIL.

40. (1) Handing over of works: - The Contractor shall be bound to hand over the works executed under the contract to the DFCCIL complete in all respects to the satisfaction of the Engineer. The Engineer shall determine the date on which the work is considered to have been completed, in support of which his certificate shall be regarded as sufficient evidence for all purposes. The Engineer shall determine from time to time, the date on which any particular section of the work shall have been completed, and the contractor shall be bound to observe any such determination of the Engineer.

40.(2) Clearance of site on completion: - On completion of works, the Contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and works clean and in a workman like condition to the satisfaction of the Engineer. No final payment in settlement of the accounts for the works shall be paid, held to be due or shall be made to the, Contractor till, in addition to any other condition necessary for final payment, site clearance shall have been affected by him, and such clearance may be made by the Engineer at the expense of the Contractor in the event of his failure to comply with this provision within 7 days after receiving notice to that effect. Should it become necessary for the Engineer to have the site cleared at the expenses of the Contractor, the DFCCIL shall not be held liable for any loss or damage to such of the Contractor's property as may be on the site and due to such removal there from which removal may be effected by means of public sales of such materials and property or in such a way as deemed fit and convenient to the Engineer.

VARIATIONS IN EXTENT OF CONTRACT

41. Modification to contract to be in writing: - In the event of any of the provisions of the contract requiring to be modified after the contract documents have been signed, the modifications shall be made in writing and signed by the DFCCIL and the Contractor and no work shall proceed under such modifications until this has been done. Any verbal or written arrangement abandoning, modifying, extending, reducing or supplementing the contract or any of the terms thereof shall be deemed conditional and shall not be binding on the DFCCIL unless and until the same is incorporated in a formal instrument and signed by the DFCCIL and the Contractor, and till then the DFCCIL shall have the right to repudiate such arrangements.

42.(1) Powers of modification to contract:- The Engineer on behalf of the DFCCIL shall be entitled by order in writing to enlarge or extend, diminish or reduce

the works or make any alterations in their design, character position, site, quantities, dimensions or in the method of their execution or in the combination and use of materials for the execution thereof or to order any additional work to be done or any works not to be done and the contractor will not be entitled, to any compensation for any increase/reduction in the quantities of work but will be paid only for the actual amount of work done and for approved materials supplied against a specific order.

42.(2) (i) Unless otherwise specified in the contract, the accepted variation in quantity of each individual item of the contract would be up to 25% of the quantity originally contracted, except in case of foundation work. 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 works.

(ii) In case of earthwork, the variation limit of 25% shall apply to the gross quantity of earth work and variation in the quantities of individual classifications of soil shall not be subject to this limit.

(iii) In case of foundation work, no variation limit shall apply and the work shall be carried out by the contractor on agreed rated irrespective of any variation.

42.(3) **Valuation of variations:-** The enlargements, extensions, diminution, reduction, alterations or additions referred to in sub-clause (2) of this clause shall in no degree affect the validity of the contract but shall be performed by the Contractor as provided therein and be subject to the same conditions, stipulations and obligations as if they had been originally and expressively included and provided for in the specifications and drawings and the amounts to be paid therefore shall be calculated in accordance with the accepted schedule of rates. Any extra items / quantities of work falling outside the purview of the provisions of sub-clause (2) above shall be paid for at the rates determined under clause-39 of these conditions.

42.(4) **Variations In Quantities During Execution of Works Contracts: -** The procedure detailed below shall be adopted for dealing with variations in quantities during execution of works contracts:

1. Individual NS items in contracts shall be operated with variation of plus or minus 25% and payment would be made as per the agreement rate. For this, no finance concurrence would be required.

2. In case an increase in quantity of an individual item by more than 25% of the agreement quantity is considered unavoidable, the same shall be got executed by floating a fresh tender. If floating a fresh tender for operating that item is considered not practicable, quantity of that item may be operated in excess of 125% of the agreement quantity subject to the following conditions:

(a) Operation of an item by more than 125% of the agreement quantity needs the approval of Competent Authority of DFCCIL;

(i) Quantities operated in excess of 125% but upto 140% of the agreement quantity of the concerned item, shall be paid at 98% of the rate awarded for that item in that particular tender;

(ii) Quantities operated in excess of 140% but upto 150% of the agreement quantity of the concerned item shall be paid at 96% of the rate awarded for that item in that particular tender;

(iii) Variation in quantities of individual items beyond 150% will be prohibited and would be permitted only in exceptional unavoidable circumstances with the concurrence of associate finance and shall be paid at 96% of the rate awarded for that item in that particular tender.

(b) The variation in quantities as per the above formula will apply only to the Individual items of the contract and not on the overall contract value.

(c) Execution of quantities beyond 150% of the overall agreemental value should not be permitted and, if found necessary, should be only through fresh tenders or by negotiating with existing contractor, with prior concurrence of finance and approval of Competent Authority of DFCCIL.

3. In cases where decrease is involved during execution of contract:

(a) The contract signing authority can decrease the items upto 25% of individual item without finance concurrence.

(b) For decrease beyond 25% for individual items or 25% of contract agreement value, the approval of competent authority, after obtaining 'No Claim Certificate' from the contractor and with finance concurrence, giving detailed reasons for each such decrease in the quantities.

(c) It should be certified that the work proposed to be reduced will not be required in the same work.

4. The limit for varying quantities for minor value items shall be 100% (as against 25% prescribed for other items). A minor value item for this purpose is defined as an item whose original agreement value is less than 1 % of the total original agreement value.

5. No such quantity variation limit shall apply for foundation items.

6. As far as SOR items are concerned, the limit of 25% would apply to the value of SOR schedule as a whole and not on individual SOR items. However, in case of NS items, the limit of 25% would apply on the individual items irrespective of the manner of quoting the rate (single percentage rate or individual item rate).

7. Deleted.

8. Deleted.

9. Deleted.

10. The aspect of vitiation of tender with respect to variation in quantities should be checked and avoided. In case of vitiation of the tender (both for increase as well as decrease of value of contract agreement), sanction of the competent authority as per schedule of power of DFCCIL as per single tender should be obtained.

Note: Variation to be approved should be limited so as not to completely change the scope, character and purpose of the original contract.

CLAIMS

43.(1) **Monthly Statement of Claims: -** The Contractor shall prepare and furnish to the Engineer once in every month an account giving full and detailed particulars of all claims for any additional expenses to which the Contractor may consider himself entitled to and of all extra or additional works ordered by the Engineer which he has executed during the preceding month and no claim for payment for and such work will be considered which has not been included in such particulars.

43.(2) **Signing of "No Claim" Certificate: -** The Contractor shall not be entitled to make any claim whatsoever against the DFCCIL under or by virtue of or arising out of this contract, nor shall the DFCCIL entertain or consider any such claim, if made by the Contractor, after he shall have signed a "No Claim" Certificate in favour of the DFCCIL in such form as shall be required by the DFCCIL after the works are finally measured up. The contractor shall be debarred from disputing the correctness of the items covered by "No Claim" Certificate or demanding a clearance to arbitration in respect thereof.

MEASUREMENTS, CERTIFICATES AND PAYMENTS

44. **Quantities in schedule annexed to Contract: -** The quantities set out in the accepted schedule of rates with items of works quantified are the estimated quantities of the works and they shall not be taken as the actual and correct quantities of the work to be executed by the Contractor in fulfilment of his obligations under the contract.

45.(i) Measurement of works: - The Contractor shall be paid for the works at the rates in the accepted schedule of rates and for extra works at rates determined under Clause 39 of these conditions on the measurements taken by the Engineer or the Engineer's representative in accordance with the rules prescribed for the purpose by the DFCCIL. The quantities for items the unit of which in the accepted schedule of rates is 100 or 1000 shall be calculated to the nearest whole number, any; fraction below half being dropped and half and above being taken as one; for items the unit of which in the accepted schedule of rates is single, the quantities shall be calculated to two places of decimals. Such measurements will be taken of the work in progress from time to time and at such intervals as in the opinion of the Engineer shall be proper having regard to the progress of works. The date and time on which "on account" or final measurements are to be made shall be communicated to the Contractor who shall be present at the site and shall sign the results of the measurements (which shall also be signed by the Engineer or the Engineer's representative) recorded in the official measurements book as an acknowledgement of his acceptance of the accuracy of the measures. Failing the Contractor's attendance, the work may be measured up in his absence and such measurements shall, notwithstanding such absence, be binding upon the Contractor whether or not he shall have signed the measurement books provided always that any objection made by him to measurement shall be duly investigated and considered in the manner set out below: -

(a) It shall be open to the Contractor to take specific objection to any recorded measurements or Classification on any ground within seven days of the date of such measurements. Any re-measurement taken by the engineer or the Engineer's representative in the presence of the Contractor or in his absence after due notice has been given to him in consequence of objection made by the Contractor shall be final and binding on the Contractor and no claim whatsoever shall thereafter be entertained regarding the accuracy and classification of the measurements.

(b) If an objection raised by the Contractor is found by the Engineer to be incorrect the Contractor shall be liable to pay the actual expenses incurred in measurements.

45(ii). Measurement of works by Contactor's Authorized Representative (in case the contract provides for the same):

(a) The Contractor shall be paid for the works at the rates in the accepted Schedule of Rates and for extra works at rates determined under Clause 39 of these conditions on the measurements taken by the Contractor's authorized engineer in accordance with the rules prescribed for the purpose by the Railway. The quantities for items the unit of which in the acceptable Schedule of Rates is 100 or 1000 shall be calculated to the nearest whole number, any fraction below half being dropped and half and above being

taken as one; for items the unit of which in the accepted Schedule of Rates is single, the quantities shall be calculated to two places of decimals. Such measurements will be taken of the work in progress from time to time. The date and time on which 'on account' or 'final' measurements are to be made shall be communicated to the Engineer.

The date and time of test checks shall be communicated to the contractor who shall be present at the site and shall witness the test checks, failing the contractor's attendance the test checks may be conducted in his absence and such test checks shall not be withstanding such absence be binding upon contractor provided always that any objection made by contractor to test check shall be duly investigated and considered in the manner set out below:

(i) It shall be open to the contractor to take specific objection to test checks of any recorded measurement within 7 days of date of such test checks. Any re-test check done by the concerned Railway's/DFCCIL's authority in the presence of the Contractor or in his absence after due notice given to him in consequent of objection made by the Contractor shall be final and binding on the Contractor and no claim whatsoever shall thereafter be entertained regarding the accuracy and classification of the measurements.

(ii) If an objection raised by the Contractor is found by the Engineer to be incorrect the Contractor shall be liable to pay the actual expenses incurred in measurements.

(b) Incorrect measurement, actions to be taken

If in case during test check or otherwise, it is detected by the Engineer that agency has claimed any exaggerated measurement or has claimed any false measurement for the works which have not been executed; amounting to variation of 5% or more of claimed gross bill amount, action shall be taken as following:

(i) On first occasion of noticing exaggerated / false measurement. Engineer shall impose a penalty of 10% of claimed gross bill value.

(ii) On any next occasion of noticing any exaggerated/false measurement, railway shall impose penalty of 15% of claimed gross bill value. In addition, the facility of recording of measurements by contractor as well as release of provisional payment shall be withdrawn. Once withdrawn, measurements shall be done by railway/DFCCIL as per clause 45(i) above.

46. (1) "On-Account" Payments: - The Contractor shall be entitled to be paid from time to time by way of "One-Account" payment only for such works as in the opinion of the Engineer he has executed in terms of the contract. All payments

due on the Engineer's or the Engineer's representative's certificates of measurements or Engineer's certified "contractor's authorized engineer's measurements" shall be subject to any deductions which may be made under these presents and shall further be subject to, unless otherwise required by Clause 16 of these conditions, a retention of ten percent by way of security deposits, until the amount of security deposit by way of retained earnest money and such retentions shall amount to 10% of the total value of the contract provided always that the Engineer may by any certificate make any correction or modification in any previous certificate which shall have been issued by him and that the Engineer may withhold any certificate if the works or any part thereof are not being carried out to his satisfaction.

46.(2) **Rounding off amounts: -** The total amount due on each certificate shall be rounded off to the nearest rupee i.e. sum less than 50 paise shall be omitted and sums of 50 paise and more upto Re. 1/- will be reckoned as Re. 1/-

46.(3) **On Account Payments not prejudicial to final settlement: -** "On- Account" payments made to the 'Contractor shall be without prejudice to the final making up of the accounts (except where measurements are specifically noted in the Measurement Book as "Final Measurements" and as such have been signed by the Contractor and Engineer's / Engineer's Representative) and shall in no respect be considered or used as evidence of any facts stated in or to be inferred from such accounts nor of any particular quantity of work having been executed nor of the manner of its execution being satisfactory.

46.(4) **Manner of payment: -** Unless otherwise specified payments to the Contractor will be made by cheque/RTGS but no cheque/RTGS will be issued for and amount less than Rs. 100/-

46A PRICE VARIATION CLAUSE:

46A.1 Applicability: Price variation clause shall be applicable for this contract and irrespective of the contract completion period. Variation in quantities shall not be taken into account for applicability of PVC in the contract.

Materials supplied free of cost by DFCCIL to the contractors shall fall outside the purview of price variation clause. If, in any case, accepted offer include some specific payment to be made to consultant or some materials supplied by DFCCIL free or at fixed rate, such payment shall be excluded from the gross value of the work for the purpose of payment /recovery of price variation.

46A.2 Base month: The base month for the 'Price Variation Clause' shall be taken as month of opening of tender including extensions, if any, unless otherwise stated elsewhere. The quarter of applicability of PVC shall commence from the month

following the month of opening of tender. The price variation shall be based on the average price Index of the quarter under consideration.

46A.3 Validity: Rates accepted by DFCCIL shall hold good till completion of work and no additional claim shall be admissible on account of fluctuations in market rates increase in taxes / any other levies / tolls etc except that payment recovery for overall market situation shall be made as per Price variation clause given hereunder.

46A.4 Adjustment for variation in prices of material, labour, fuel, explosives detonators, steel, concreting, ferrous, nonferrous, insulator, zinc and cement shall be determined in the manner prescribed hereunder.

46A.5 Components of various items in a contract on which variation in prices be admissible shall be material, labour, fuel, explosives detonators, steel, cement and lime, concreting, ferrous, nonferrous, insulator, zinc, erection, etc. However, for fixed component, no price variation shall be admissible.

46A.6 The percentages of labour, material, fuel, component etc. in various types of Engineering Works shall be as under:

Component	% age	Component	% age
(A**) Earthwork contracts**	N.A		
Labour component	-	Other material components	-
Fuel component	-	Fixed component *	-
(B**) Ballast and Quarry products Contracts**	N.A		
Labour component	-	Other material components	-
Fuel component	-	Fixed component*	-
(C**) Tunneling Contracts**	N.A		
Labour component		Detonator Component	-
Fuel component	-	Other material components	-
Explosive Component	-	Fixed component*	-
(D) Other work Contracts**			
Labour component	30%	Fuel component	15%
Material component	40%	Fixed component*	15%

* It shall not be considered for any price variation

** Category of PVC applicable for Schedules A1, A2, B1, B2, C1 and C2 (other than supply of cement in schedules E1 & E2 and steel in schedules D1, D2, F1 & F2)

46A.7 Formulae: The amount of variation in prices (increase/decrease) in the several components (labour, material etc.) shall be worked out by the following formulae:

(i) $L = W \times (L_Q - L_B) \times L_C / (L_B \times 100)$

(ii) $M = W \times (M_Q - M_B) \times M_C / (M_B \times 100)$

(iii) $F = W \times (F_Q - F_B) \times F_C / / (F_B \times 100)$

(iv) $S = S_W \times (S_Q - S_B) / S_B$

- *Applicable for Schedule D1, D2, F1 & F2. No other PVC shall be paid on Schedule D1, D2, F1 & F2.*

(v) $C = C_V \times (C_Q - C_B) / C_B$

- *Applicable for Schedule E1 & E2. No other PVC shall be paid on Schedule E1 & E2*.

Where,

L Amount of price variation in Labour.

M Amount of price variation in Materials.

F Amount of price variation in Fuel.

S Amount of price variation in Steel.

C Amount of price variation in Cement.

L_C % of Labour component

M_C % of Material component

F_C % of Fuel component

W Gross value of work done by Contractor as per on-account bill(s) excluding cost of materials supplied by Railway at fixed price, minus the price values of cement and steel. This will also exclude specific payment, if any, to be made to the

consultants engaged by Contractors (such payment shall be indicated in the Contractor's offer)

L_B Consumer Price Index for Industrial Workers - All India : Published in R.B.I. Bulletin for the base period

L_Q Consumer Price Index for Industrial Workers - All India : Published in R.B.I. Bulletin for the average price index of the 3 months of the quarter under Consideration

M_B Wholesale Price Index: All commodities – as published in the R.B.I. Bulletin for the base period

M_Q Wholesale Price Index: All commodities – as published in the R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration

F_B Wholesale Price Index for the group Fuel & Power as published in the R.B.I. Bulletin for the base period

F_Q Index Number of Wholesale Price Index – By Groups and Sub-Groups for the group Fuel & Power as published in the R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration

S_W Gross value of steel supplied by the Contractor as per the 'on-account' bill for the month under consideration

S_B Index number of Monthly Whole Sale Price Index for the relevant category of mild steel item as mentioned in Clause 46A.9, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP); for the base period.

S_Q Index number of Monthly Whole Sale Price Index for the relevant category of mild steel item as mentioned in Clause 46A.9, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP); for the average price index of the 3 months of the quarter under consideration.

C_V Value of Cement supplied by Contractor as per on account bill in the quarter under consideration

C_B Index No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the base period

C_Q No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration. **"**

46A.8 The demands for escalation of cost shall be allowed on the basis of provisional indices as mentioned above in Clause 46A.7. Any adjustment needed to be done based on the finally published indices shall be made as and when they become available.

46A.9 Relevant categories of steel for the purpose of operating Price Variation formula as mentioned in this Clause shall be as under:

SL	Category of steel in this work	Category of Steel Items as mentioned in Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP)
1.	Reinforcement bars and other rounds	'MS Bright Bars' individual commodity of group item (d) Mild Steel-Long Products under (N) MANUFACTURE OF BASIC METAL.
2.	All types and sizes of angles, channels and joists etc.	'Angles, Channels, Sections, Steel' individual commodity of group item (d) Mild Steel-Long Products under (N) MANUFACTURE OF BASIC METAL.
3.	All types and sizes of plates	'e. Mild Steel – Flat Products' of (N) MANUFACTURER OF BASIC METAL.
4.	Any other section of steel not covered in the above categories and excluding HTS	Average of price for the 3 categories covered under SL 1, 2 & 3 above

Special Note:

(1) It is clearly indicated that price variation implies both increase as well decrease in input prices and therefore price variation during the currency of the contract may result in extra payment or recovery as the case may be.

(2) The Index Number for the base period will be the Index Number as obtained for the month of opening of the tender and the quarter will commence from the month following the month of opening of tender. If the rates quoted in negotiated tenders are accepted, the base month for PVC will be month in which Negotiations are held.

(3) General Conditions of Contract shall be applicable in context of Price variation. However, decision of Engineer shall be final & finding, in case of any conflict.

46A.10 Price Variation During Extended Period of Contract

The price adjustment as worked out above, i.e. either increase or decrease shall be applicable upto the stipulated date of completion of work including the extended period of completion where such extension has been granted under Clause 17-A of the General Conditions of Contract. However, where extension of time has been granted due to contractor's failure under Clause 17-B of the General Conditions of Contract, price adjustment shall be done as follows:

(a) In case the indices increase above the indices applicable to the last month of original completion period or the extended period under Clause 17-A, the price adjustment for the period of extension granted under Clause 17-B shall be limited to the amount payable as per the Indices applicable to the last month of the original completion period or the extended period under Clause 17-A of the General Conditions of Contract; as the case may be.

(b) In case the indices fall below the indices applicable to the last month of original/extended period of completion under Clause 17-A, as the case may be; then the lower indices shall be adopted for the price adjustment for the period of extension under Clause 17-B of the General Conditions of Contract.

47.0 **Maintenance of works:-** The Contractor shall at all times during the progress and continuance of the works and also for the period of maintenance specified in the Tender Form after the date of passing of the certificate of completion by the Engineer or any other earlier date subsequent to the completion of the works that may be fixed by the Engineer be responsible for and effectively maintain and uphold in good substantial, sound and perfect condition all and every part of the works and shall make good from time to time and at all times as often as the

Engineer shall require, any damage or defect that may during the above period arise in or be discovered or be in any way connected with the works, provided that such damage or defect is not directly caused by errors in the contract documents, act of providence or insurrection or civil riot, and the contractor shall be liable for and shall pay and make good to the DFCCIL or other persons legally entitled thereto whenever required by the Engineer so to do, all losses, damages, costs and expenses they or any of them may incur or be put or be liable to by reasons or in consequence of the operations of the Contractor or of his failure in any respect.

48.(1) **Certificate of completion of works:** - As soon as in the opinion of the Engineer, the works has been completed and has satisfactorily passed any final test or tests that may be prescribed, the Engineer shall issue a certificate of completion duly indicating the date of completion in respect, of the work and the period of maintenance of the work shall commence from the date of completion mentioned in such certificate. The Engineer may also issue such a certificate indicating

date of completion with respect to any part of the work (before the completion of the whole of work), which has been both completed to the satisfaction of the Engineer and occupied or used by the DFCCIL. When any such certificate is given in respect of part of a work, such part shall be considered as completed and the period of maintenance of such part shall commence from the date of completion mentioned in the completion certificate issued for that part of the work.

48.(2) Contractor not absolved by completion Certificate:- The Certificate of completion in respect of the works referred to in sub-clause (1) of this clause shall not absolve the Contractor from his liability to make good any defects imperfections, shrinkages or faults which may appear during the period of maintenance specified in the tender arising in the opinion of the Engineer from materials or workmanship not in accordance with the drawings or specifications or instruction of the Engineer, which defects, imperfections, shrinkages or faults shall upon the direction in writing of the Engineer be amended and made good by the Contractor at his own cost: and in case of default on the part of Contractor the Engineer may employ labour and materials or appoint another Contractor to amend and make good such defects, imperfections, shrinkages and faults and all expenses consequent thereon and incidental thereto shall be borne by the Contractor and shall be recoverable from any moneys due to him under the contract.

49.0 Approval only by maintenance Certificate:- No certificate other than maintenance certificate referred to in Clause 50 of the conditions shall be deemed to constitute approval of any work or other matter in respect of which it is issued or shall be taken as an admission of the due performance of the contract or any part thereof or of the accuracy of any claim or demand made by the Contractor or of additional varied work having been ordered by the Engineer nor shall any other certificate conclude or prejudice any of the powers of the Engineer.

50.(1) Maintenance Certificate: - The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the Engineer stating that the works have been completed and maintained to his satisfaction. The Maintenance Certificate shall be given by the Engineer upon the expiration of the period of maintenance or as soon thereafter as any works ordered during such period pursuant to sub clause (2) Clause 48 of these conditions shall have been completed to the satisfaction of the Engineer and full effect shall be given to this Clause notwithstanding the taking possession of or using the works or any part thereof by the DFCCIL.

50.(2) Cessation of Railway's / DFCCIL Liability: - The DFCCIL shall not be liable to the Contractor for any matter arising out of or in connection with the contract of the execution of the works unless the contractor shall have made a claim in writing in respect thereof before the issue of the Maintenance Certificate under this clause.

50.(3) Unfulfilled Obligations:- Notwithstanding the issue of the Maintenance certificate the Contractor and (subject to sub-clause 2 of this clause) the DFCCIL shall remain liable for the fulfilment of any obligation incurred under the provision of the contract prior to the issue of the maintenance Certificate which remains unperformed at the time such certificate is issued and for the purposes of determining the nature and extent of any such obligations the contract shall be deemed to remain in force between the parties thereto.

51.(1) Final Payment:- On the Engineer's certificate of completion in respect of the works, adjustment shall be made and the balance of account based on the Engineer or the Engineer's representative's certified measurements or Engineer's certified "contractor's authorized engineer's measurements" of the total quantity of work executed by the contractor upto the date of completion and on the accepted schedule or rates and for extra works on rates determined under Clause 39 of these conditions shall be paid to the Contractor subject always to any deduction which may be made under these presents and further subject to the Contactor having delivered to the Engineer either a full account in detail of all claims he may have on the DFCCIL in respect of the works or having delivered "No Claim Certificate" and the Engineer having after the receipt of such account given a certificate in writing that such claims are correct, that the whole of the works to be done under the provisions of the Contracts have been completed, that they have been inspected by him since their completion and found to be in good and substantial order, that all properties, works and things, removed, disturbed or injured in consequence of the woks have been properly replaced and made good and all expenses and demands incurred by or made upon the DFCCIL for or in the respect of damage or loss by from or in consequence of the works, have been satisfied agreeably and in conformity with the contract.

51.(2) Post Payment Audit:- It is an agreed term of contract that the DFCCIL reserves to itself the right to carry out a post-payment audit and or technical examination of the works and the final bill including all supporting vouchers, abstracts etc. and to make a claim on the contractor for the refund any excess amount paid to him if as a result of such examination any over-payment to him is discovered to have made in respect of any works done or alleged to have been done by him under the contract.

51A. Production of vouchers etc. by the Contractor: -

(i) For a contract of more than one crore of rupees, the contractor shall, whenever required, produce or cause to be produced for examination by the Engineer any quotation, invoice, cost or other account, book of accounts, voucher, receipt, letter, memorandum, paper of writing or any copy of or extract from any such document and also furnish information and returns verified in such manner as may be required in any way relating to the execution of this contract or relevant for

verifying or ascertaining cost of execution of this contract (the decision of the engineer on the question of relevancy of any documents, information or return being final and binding in the parties).The contractor shall similarly produce vouchers; etc., if required to prove to the Engineer, that materials supplied by him, are in accordance with the specifications laid down in the contract.

(ii) If any portion of the work in a contract of value more than one crore of rupees be carried out by a sub-contractor or any subsidiary or allied firm or company (as per Clause 7 of the General Conditions of Contract), the Engineer shall have power to secure the books of such sub-contract or any subsidiary or allied firm or company, through the contractor, and such books shall be open to his inspection.

(iii) The obligations imposed by sub clause (i) & (ii) above is without prejudice to the obligations of the contractor under any statute rules or orders binding on the contractor.

52.0 Withholding and lien in respect of sums claimed: -

Whenever any claim or claims for payment of a sum of money arises out of or under the contract against the contractor, the DFCCIL shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any, deposited by the contractor and for the purpose aforesaid, the DFCCIL shall be entitled to withhold the said cash security deposit or the security if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the DFCCIL shall be entitled to withhold and have a lien to the extent of the such claimed amount or amounts referred to supra, from any sum or sums found payable or which at any time thereafter may become payable to the contractor under the same contract or any other contract with this or any other DFCCIL or any Department of the Central Government pending finalization or adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above, by the DFCCIL will be kept withheld or retained as such by the DFCCIL till the claim arising out of or under the contract is determined by the arbitrator (if the contract governed by the arbitration clause) or by the competent court as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to supra and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the DFCCIL shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company, as the case may be whether in his individual capacity or otherwise.

52A. Lien in respect of claims in Other Contracts: -

(i) Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the DFCCIL, against any claim of this or any other DFCCIL or any other Department of the Central Government in respect of a payment of a sum of money arising out of or under any other contract made by the contractor with this or any other Department of the Central Government.

(ii) However, recovery of claims of DFCCIL in regard to terminated contracts may be made from the Final Bills, Security Deposits and Performance Guarantees of other contract or contracts, executed by the contractor. The Performance Guarantees submitted by the Contractor against other contracts, if required, may be withheld and encashed. In addition, 10% of each subsequent 'on-account bill' may be withheld, if required, for recovery of DFCCIL/Railways' dues against the terminated contract.

(iii) It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the DFCCIL will be kept withheld or retained as such by the DFCCIL till the claim arising out of or under any other contract is either mutually settled or determined by arbitration, if the other contract is governed by arbitration clause or by the competent court as the case may be and contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

53.0 Signature on Receipts for Amounts:- Every receipt for money which may become payable or for any security which may become transferable to the Contractors under these presents, shall, if signed in the partnership name by anyone of the partners of a Contractor's firm be a good and sufficient discharge to the DFCCIL in respect of the moneys or security purported to be acknowledged thereby and in the event of death of any of the Contractor, partners during the pendency of the contract it is hereby expressly agreed that every receipt by anyone of the surviving Contractor partners shall if so signed as aforesaid be good a sufficient discharge as aforesaid provided that nothing in this clause contained shall be deemed to prejudice or effect any claim which the DFCCIL may hereafter have against the legal representative of any contractor partner so dying for or in respect to any breach of any of the conditions of the contract, provided also that nothing in this clause contained shall be deemed to prejudice or effect the respective rights or obligations of the Contractor partners and of the legal representatives of any deceased Contractor partners inters.

LABOUR

54.0 Wages to Labour: - The Contractor shall be responsible to ensure compliance with the provision of the Minimum Wages Act, 1948 (hereinafter referred to as the "said Act" and the Rules made there under in respect of any employees directly or through petty contractors or subcontractors employed by him on road construction or in building operations or in stone breaking or stone crushing for the purpose of carrying out this contract.

If, in compliance with the terms of the contract, the Contractor supplied any labour to be used wholly or partly under the direct orders and control of the DFCCIL whether in connection with any work being executed by the Contractor or otherwise for the purpose of the DFCCIL such labour shall, for the purpose of this clause, still be deemed to be persons employed by the Contractor.

If any moneys shall, as a result of any claim or application made under the said Act be directed to be paid by the DFCCIL, such money shall be deemed to be moneys paid by it as aforesaid within seven days after the same shall have been demanded, the Railway/DFCCIL shall be entitled to recover the same form any moneys due or accruing to the Contractor under this or any other Contract with the DFCCIL.

54A. Apprentices Act: - The Contractor shall be responsible to ensure compliance with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time in respect of apprentices directly or through petty contractors or sub-contractors employed by him for the purpose of carrying out the Contract.

If the contractor directly or through petty contractors or sub-contractors fails to do so, his failure will be a breach of the contract and the DFCCIL may, in its discretion, rescind the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation of the provisions of the Act.

Note: The contractors are required to engage apprentices when the works undertaken by them last for a period of one year or more and / the cost of works is rupees one lakh or more.

55.0 Provisions of payments of Wages Act: - The Contractor shall comply with the provisions of the Payment of Wages Act, 1936 and the rules made there under in respect of all employees directly or through petty contractors or sub-contractors employed by him in the works. If In compliance with the terms of the contract, the Contractor directly or through petty contractors of sub-contractors shall supply any labour to be used wholly or partly under the direct orders and control of the Engineer whether in connection with the works to be executed hereunder or

otherwise for the purpose of the Engineer such labour shall never the less be deemed to comprise persons employed by the contractor and any moneys which may be ordered to be paid by the Engineer shall be deemed to be moneys payable by the Engineer on behalf of the Contractor and the Engineer may on failure of the contractor to repay such money to the Railways/DFCCIL deduct the same from moneys due to contractor in the terms of contract. The DFCCIL shall be entitled to deduct from any moneys due to the contractor (whether under this contract or any other contract) all moneys paid or payable by the DFCCIL by the way of compensation of aforesaid or for costs of expenses in connection with any claim thereto and the decision of the Engineer upon any question arising out of the effect or force of this clause shall be final and binding upon the Contractor.

55A. Provisions of Contract labour (Regulation and Abolition) Act, 1970:

55A.(1) The contractor shall comply with the provision of the contract labour (Regulation and Abolition) Act, 1970 and the Contract labour (Regulation and Abolition) Central Rules 1971 as modified from time to time, wherever applicable and shall also indemnify the DFCCIL from and against any claims under the aforesaid Act and the Rules.

55A.(2) The Contractor shall obtain a valid licence under the aforesaid Act as modified from time to time before the commencement of the work and continue to have a valid licence until the completion of the work. Any failure to fulfil the requirement shall attract the penal provision of the Contract arising out of the resultant non-execution of the work.

55A.(3) The Contractor shall pay to the labour employed by him directly or through subcontractors the wages as per provision of the aforesaid Act and the Rules wherever applicable. The Contractor shall notwithstanding the provisions of the contract to the contrary, cause to be paid the wages to labour indirectly engaged on the works including any engaged by subcontractors in connection with the said work, as if the labour had been immediately employed by him.

55A.(4) In respect of all labour directly or indirectly employed in the work for performance of the contractor's part of, the contract, the Contractor shall comply with or cause to be complied with the provisions of the aforesaid Act and Rules wherever applicable.

55A.(5) In every case in which, by virtue of the provisions of the aforesaid Act or the Rules, the DFCCIL is obliged to pay any amount of wages to a workman employed by the Contractor or his sub-contractor in execution of the work or to incur any expenditure on account of the Contingent, liability of the DFCCIL due to the contractor's failure to fulfil his statutory obligations under the aforesaid Act or the rules the DFCCIL will recover from the Contractor, the amount of wages so paid or the amount of expenditure so incurred, and without prejudice to the rights of the DFCCIL under the section 20, sub-section (2) and section 2, sub-section (4) of the

aforesaid Act, the DFCCIL shall be at liberty to recover such amount or part thereof by deducting it from the security deposit and/ or from any sum due by the DFCCIL to the contractor whether under the contract or otherwise. The DFCCIL shall not be bound to contest any claim made against it under sub-section (1) of section 20 and sub-section (4) of section 21 of the aforesaid Act except on the written request of the contractor and upon his giving to the DFCCIL full security for all costs for which the DFCCIL might become liable in contesting such claim. The decision of the DFCCIL regarding the amount actually recoverable from the contractor as stated above shall be final and binding on the Contractor.

55B. Provisions of Employees Provident Fund and Miscellaneous Provisions Act, 1952:

The Contractor shall comply with the provisions of Para 30 & 36-B of the Employees Provident Fund Scheme, 1952; Para 3 & 4 of Employees' Pension Scheme, 1995; and Para 7 & 8 of Employees Deposit Linked Insurance Scheme, 1976; as modified from time to time through enactment of" Employees Provident Fund & Miscellaneous Provisions Act, 1952", wherever applicable and shall also indemnify the DFCCIL from and against any claims under the aforesaid Act and the Rules.

55C. Provisions of "The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996" and "The Building and Other Construction Workers' Welfare Cess Act, 1996":

The tenderers, for carrying out any construction work, must get themselves registered with the Registering Officer under Section-7 of the Building and Other Construction Workers Act, 1996 and rules made thereto by the concerned State Govt. and submit certificate of Registration, issued from the Registering Officer of the concerned State Govt. (Labour Dept.). As per this Act, the tenderer shall be levied a cess @1% of cost of construction work, which would be deducted from each bill. Cost of material, when supplied under a separate schedule item, shall be outside the purview of cess.

56.0 Reporting of Accidents of Labour: - The Contractor shall be responsible for the safety of all employees directly or through petty contractors or sub- contractor employed by him on the works and shall report serious accidents to any of them however and wherever occurring on the works to the Engineer or the Engineers Representative and shall made every arrangement to render all possible assistance.

57.0 Provision of Workmen's Compensation Act:- In every case in which by virtue of the provisions of section 12 sub-section (1) of the Workmen's Compensation Act 1923, DFCCIL is obliged to pay compensation to a workman directly or through petty contractor or subcontractor employed by the Contractor in executing the work, DFCCIL will recover from the Contractor the amount of the compensation so paid, and, without prejudice to the rights of DFCCIL under Section 12 Sub-section (2) of the said Act, DFCCIL shall be at liberty to recover such amount or

any part thereof by deducting it from the security deposit or from any sum due by DFCCIL to the Contractor whether under these conditions or otherwise, DFCCIL shall not be bound to contest any claim made against it under Section 12 Sub-section (1) of the said Act except on the written request of the Contractor and upon his giving to DFCCIL full security for all costs for which DFCCIL might become liable in consequence of contesting such claim.

57A. Provision of Mines Act:- The contractor shall observe and perform all the provisions of the Mines Act, 1952 or any statutory modifications or re-enactment thereof for the time being in force and any rules and regulations made there under in respect of all the persons directly or through the petty contractors or sub-contractors employed by him under this contract and shall indemnify the DFCCIL from and against any claims under the Mines Act, or the rules and regulations framed there under, by or on behalf of any persons employed by him or otherwise.

58.0 Railway/DFCCIL not to provide quarters for Contractors: - No quarters shall normally be provided by the DFCCIL for the accommodation of the contractor or any of his staff employed on the work.

59.(1) Labour Camps: - The contractor shall at his own expense make adequate arrangements for the housing, supply of drinking water and provision of latrines and urinals for his staff and workmen, directly or through the petty contractors or sub-contractors and for temporary crèche (Bal-mandir) where 50 or more women are employed at a time. Suitable sites on DFCCIL land, if available, may be allotted to the contractor for the erection of labour camps, either free of charge or on such terms and conditions that may be prescribed by the DFCCIL. All camp sites shall be maintained in clean and sanitary conditions by the contractor at his own cost.

59.(2) Compliance to rules for employment of labour: - The contractor(s) shall conform to all laws, by-laws rules and regulations for the time being in force pertaining to the employment of local or imported labour and shall take all necessary precautions to ensure and preserve the health and safety of all staff employed directly or through petty contractors or sub-contractors on the works.

59.(3) Preservation of peace: - The contractor shall take requisite precautions and use his best endeavours to prevent any riotous or unlawful behaviour by or amongst his workmen and other employed directly or through the petty contractors or sub-contractors on the works and for the preservation of peace and protection of the inhabitants and security of property in the neighbourhood of the works. In the event of the DFCCIL requiring the maintenance of a special Police Force at or in the vicinity of the site during the tenure of works, the expenses thereof shall be borne by the contractor and if paid by the DFCCIL shall be recoverable from the contractor.

59.(4) Sanitary arrangements: - The contractor shall obey all sanitary rules and carry out all sanitary measures that may from time to time be prescribed by the Railway Medical Authority and permit inspection of all sanitary arrangements at all times by the Engineer, the Engineer's Representative of the Medical staff of the DFCCIL. Should the contractor fail to make the adequate sanitary arrangements, these will be provided by the DFCCIL and the cost therefore recovered from the contractor.

59.(5) Outbreak of infectious disease: - The contractor shall remove from his camp such labour and their families as refuse protective inoculation and vaccination when called upon to do so by the Engineer or the Engineer's representative on the advice of the DFCCIL. Should cholera, plague or other infectious disease break out, the contractor shall burn the huts, beddings, clothes and other belongings of or used by the infected parties and promptly erect new huts on health sites as required by the engineer, failing which within the time specified in the Engineer's requisition, the work may be done by the DFCCIL and the cost therefore recovered from the contractor.

59.(6) Deleted

59.(7) Medical facilities at site: - The Contractor shall provide medical facilities at the site as may be prescribed by the Engineer on the advice of the DFCCIL in relation to the strength of the Contractor's resident staff and workmen.

59.(8) Use of intoxicants: - The sale of ardent spirits or other intoxicating beverages upon the work or in any of the buildings, encampments or tenements owned, occupied by or within the control of the contractor or any of his employees shall be forbidden and the Contractor shall exercise his influence and authority to the utmost extent to secure strict compliance with this condition.

59.(9) Non-employment of female labour: - The Contactor shall see that the employment of female labour on / in Cantonment areas, particularly in the neighbourhood of soldier's barracks, should be avoided as far as possible.

59.(10) Restrictions On The Employment Of Retired Engineers Of Railway/DFCCIL Services Within one Year Of Their Retirement : The Contractor shall not, if he is a retired Government Engineer of Gazetted rank, himself engage in or employ or associate a retired Government Engineer of Gazetted rank, who has not completed one year from the date of retirement, in connection with this contract in any manner whatsoever without obtaining prior permission of the DFCCIL and if the Contractor is found to have contravened this provision it will constitute a breach of contract and DFCCIL will be entitled to terminate the contract and forfeit Earnest Money Deposits (EMD),Performance Guarantee (PG) and Security Deposits (SD) of that contract.

60.(1) Non-employment of labours below the age of 15: - the Contractor shall not employ children below the age of 15 as labourers directly or through petty

contractors or subcontractors for the execution of work.

60.(2) Medical Certificate of fitness for labour: - It is agreed that the contractor shall not employ a person above 15 and below 19 years of age for the purpose of execution of work under the contract unless a medical certificate of fitness in the prescribed form (Proforma at Form No.15) granted to him by a certifying surgeon certifying that he is fit to work as an adult is obtained and kept in the custody of the contractor or a person nominated by him in this behalf and the person carries with him, while at work; a token giving a reference to such certificate. It is further agreed that the responsibility for having the adolescent examined medically at the time of appointment or periodically till he attains the age of 19 years shall devolve entirely on the contractor and all the expenses to be incurred on this account shall be borne by him and no fee shall be charged from the adolescent or his parent for such medical examination.

60.(3) Period of validity of medical fitness certificate: - A certificate of fitness granted or renewed for the above said purposes shall be valid only for a period of one year at a time. The certifying surgeon shall revoke a certificate granted or renewed if in his opinion the holder of it is, no longer fit for work in the capacity stated therein. Where a certifying surgeon refuses to grant or renew a certificate or revoke a certificate, he shall, if so required by the person concerned, state his reasons in writing for doing so.

60.(4) Medical re-examination of labourer:- Where any official appointed in this behalf by the Ministry of labour is of the opinion that any person employed in connection with the execution of any work under this contract in the age group 15 to 19 years is without a certificate of fitness or is having a certificate of fitness but no longer fit to work in the capacity stated in the certificate, he may serve on the Contractor, or on the person nominated by him in the regard, a notice requiring that such persons shall be examined by a certifying surgeon and such person shall not if the concerned official so directs, be employed or permitted to do any work under this contract unless he has been medically examined and certified that he has been granted a certificate of fitness or a fresh certificate of fitness, as the case may be.

EXPLANATIONS: -

(1) Only qualified medical practitioners can be appointed as “Certifying Surgeons” and the term “Qualified Medical Practitioners” means a person holding a qualification granted by an authority specified in the Schedule to the Indian Medical Degrees Act, 1916 (VII to 1916) or in the Schedule to the Indian Medical Council Act, 1933 (XXVII) of 1933.

(2) The Certifying surgeon may be a medical officer in the service of State or Municipal Corporation.

DETERMINATION OF CONTRACT

61.(1) Right of DFCCIL of determine the contract: - The DFCCIL shall be entitled to determine and terminate the contract at any time should, in the DFCCIL/Railway's opinion, the cessation of work becomes necessary owing to paucity of funds or from any other cause whatever, in which case the value of approved materials at site and of work done to date by the Contractor will be paid for in full at the rate specified in the contract. Notice in writing from the DFCCIL of such determination and the reasons therefore shall be conclusive evidence thereof.

61. (2) Payment on determination of contract: - Should the contract be determined under sub clause (1) of this clause and the Contractor claims payment for expenditure incurred by him in the expectation of completing the whole of the work, the Railways /DFCCIL shall admit and consider such claims as are deemed reasonable and are supported by vouchers to the satisfaction of the Engineer. The DFCCIL/Railway's decision on the necessity and propriety of such expenditure shall be final and conclusive.

61.(3) The contractor shall have no claim to any payment of compensation or otherwise, howsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of determination of contract.

62.(1) Determination of contract owing to default of contractor: - If the Contractor should**: -**

(i) Becomes bankrupt or insolvent, or

(ii) Make an arrangement with of assignment in favour of his creditors, or agree to carry out the contract under a Committee of Inspection of his creditors, or

(iii) Being a Company or Corporation, go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or

(iv) Have an execution levied on his goods or property on the works, or

(v) Assign the contract or any part thereof otherwise than as provided in Clause 7 of these conditions, or

(vi) Abandon the contract, or

(vii) Persistently disregard the instructions of the Engineer, or contravene any provision of the contract, or

(viii) Fail to adhere to the agreed programme of work by a margin of 10% of the

stipulated period, or

(ix) Fail to remove materials from the site or to pull down and replace work after receiving from the Engineer notice to the effect that the said materials or works have been condemned or rejected under clause 25 and 27 of these conditions, or

(x) Fail to take steps to employ competent or additional staff and labour as required under clause 26 of the conditions

(xi) Fail to afford the Engineer or Engineer's representative proper facilities for inspecting the work or any part thereof as required under clause 28 of the conditions, or

(xii) Promise, offer or give any bribe, commission, gift or advantage either himself or through his partner, agent or servant to any officer or employee of the DFCCIL or to any person on his or on their behalf in relation to the execution of this or any other contract with this DFCCIL.

(xiii)(A) At any time after the tender relating to the contract, has been signed and submitted by the Contractor, being a partnership firm admit as one of its partners or employee under it or being an incorporated company elect or nominate or allow to act as one of its directors or employee under it in any capacity whatsoever any retired engineer of the gazetted rank or any other retired gazetted officer working before his retirement, whether in the executive or administrative capacity, or whether holding any pensionable post or not, in the Railways/DFCCIL for the time being owned and administered by the President of India before the expiry of one year from the date of retirement from the said service of such Engineer or Officer unless such Engineer or Officer has obtained permission from the President of India or any officer duly authorized by him in this behalf to become a partner or a director or to take employment under the contract as the case may be, or

(xiii) (B) Fail to give at the time of submitting the said tender: -

(a) The correct information as to the date of retirement of such retired engineer or retried officer from the said service, or as to whether any such retired engineer or retired officer was under the employment of the Contractor at the time of submitting the said tender, or

(b) The correct information as to such engineers or officers obtaining permission to take employment under the contractor, or

(c) Being a partnership firm, the correct information as to, whether any of its partners was such a retired engineer or a retired officer, or

(d) Being in incorporated company, correct information as to whether any of its directors was such a retired engineer or a retired officer, or

(e) Being such a retired engineer or retried officer suppress and not disclose at the time of submitting the said tender the fact of his being such a retired engineer or a retired officer or make at the time of submitting the said tender a wrong statement in relation to his obtaining permission to take the contract or if the contractor be a partnership firm or an incorporated company to be a partner or director of such firm or company as the case may be or to seek employment under the contractor.

Then and in any of the said clause, the Engineer on behalf of the DFCCIL may serve the Contractor with a notice (Proforma at Form No.16) in writing to that effect and if the contractor does not within seven days after the delivery to him of such notice proceed to make good his default in so far as the same is capable of being made good and carry on the work or comply with such directions as aforesaid of the entire satisfaction of the Engineer, the DFCCIL shall be entitled after giving 48 hours notice (Proforma at Form No. 17) in writing under the hand of the Engineer to rescind the contract as a whole or in part or parts (as may be specified in such notice) and after expiry of 48 hours notice, a final termination notice (Proforma at Form No. 18) should be issued and adopt the following courses:

To measure up or the whole or part of the work from which the contractor has been removed and get it completed by another contractor, the manner and method in which such work is completed shall be in the entire discretion of the Engineer whose decision shall be final.

62.(2) Right of DFCCIL after, rescission of contract owing to default of contractor: In the event of any or several of the courses, referred to in sub-clause (1) of the clause, being adopted.

(a) the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any commitments or made any advances on account of or with a view to the execution of the works or the performance of the contract and contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under the contract unless and until the Engineer shall have certified the performance of such work and the value payable in respect thereof and the contractor shall only be entitled to be paid the value so certified.

(b) The Engineer or the Engineer's representative shall be entitled to take possession of any materials, tools, implements, machinery and buildings on the works or on the property on which these are being or ought to

have been executed, and to retain and employ the same in the further execution of the works or any part thereof until the completion of the works without the contractor being entitled to any compensation for the use and employment thereof or for wear and tear or destruction thereof.

(c) The Engineer shall as soon as may be practicable after removal of the contractor fix and determine ex-parte or by or after reference to the parties or after such investigation or enquiries as he may consider fit to make or institute and shall certify what amount(if any) had at the time of rescission of the contract been reasonably earned by or would reasonably accrue to the contractor in respect of the work then actually done by him under the contract and what was the value of any unused, or partially used materials, any constructional plan and any temporary works upon the site. The legitimate amount due to the contractor after making necessary deductions and certified by the Engineer should be released expeditiously.

STATEMENT OF DISPUTES - INDIAN RAILWAY ARBITRATION RULES

63.0 Matters finally determined by the DFCCIL – All disputes and differences of any kind whatsoever arising out of or in connection with the contract, whether during the progress of the work or after its completion and whether before or after the determination of the contract, shall be referred by the contractor to the Chief General Manager / General Manager /CPM, DFCCIL and the Chief General Manager/ General Manager/ CPM, DFCCIL shall within 120 days after receipt of the contractor's representation make and notify decisions on all matters referred to by the contractor in writing provided that matter for which provision has been made in clauses 8, 18, 22.(5), 39, 43.(2), 45.(a), 55, 55A.(5), 57, 57A, 61.(1), 61.(2) and 62.(1) to (xiii)(B) of General Conditions of contract or in any special clause of the conditions of the contract shall be deemed as 'excepted matters' (matters not arbitrable) and decisions of the DFCCIL authority, thereon shall be final and binding on the contractor; provided further that 'excepted matters' shall stand specifically excluded from the purview of the arbitration clause.

64.(1) Demand for Arbitration: -

64.(1)(i) In the event of any dispute or difference between the parties hereto as to the construction or operation of this contract, or the respective rights and liabilities of the parties on any matter in question, dispute or difference on any account or as to the withholding by the DFCCIL of any certificate to which the contractor may claim to be entitled to, or if the DFCCIL fails to make a decision within 120 days, then and in any such case, but except in any of the 'excepted matters' referred to in clause 63 of these conditions, the contractor, after 120 days but within 180 days of his presenting his final claim on disputed matters shall demand in writing that the dispute or difference be referred to arbitration.

64.(1)(ii)(a) The demand for arbitration shall specify the matters which are in question, or subject of the dispute or difference as also the amount of claim item wise. Only

such dispute or difference, in respect of which the demand has been made, together with counter claims or set off, given by the DFCCIL, shall be referred to arbitration and other matters shall not be included in the reference.

64.(1)(ii)(b) The parties may waive off the applicability of the sub-section 12(5) of Arbitration and Conciliation (Amendment) Act 2015, if they agree for such a waiver, in writing, after dispute having arisen between them, in the format given under Annexure XII of these conditions.

64.(1)(iii)(a) The arbitration proceedings shall be assumed to have commenced from the day, a written and valid demand for arbitration is received by the DFCCIL.

64.(1)(iii)(b) The claimant shall submit his claim stating the facts supporting the claims along with all the relevant documents and the relief or remedy sought against each claim within a period of 30 days from the date of appointment of the Arbitral Tribunal.

64.(1)(iii)(c) The DFCCIL shall submit its defence statement and counter claim(s), if any, within a period of 60 days of receipt of copy of claims from Tribunal thereafter, unless otherwise extension has been granted by Tribunal.

64.(1)(iii)(d) Place of Arbitration: The place of arbitration would be within the geographical limits of the DFCCIL where the cause of action arose or the Headquarters of the DFCCIL or any other place with the written consent of both the parties.

64.(1)(iv) No new claim shall be added during proceedings by either party. However, a party may amend or supplement the original claim or defence thereof during the course of arbitration proceedings subject to acceptance by Tribunal having due regard to the delay in making it.

64.(1)(v) If the contractor(s) does/do not prefer his/their specific and final claims in writing, within a period of 90 days of receiving the intimation from the Railways/DFCCIL that the final bill is ready for payment, he/they will be deemed to have waived his/their claim(s) and the Railways/DFCCIL shall be discharged and released of all liabilities under the contract in respect of these claims.

64.(2) Obligation During Pendency of Arbitration: – Work under the contract shall, unless otherwise directed by the Engineer, continue during the arbitration proceedings, and no payment due or payable by the DFCCIL shall be withheld on account of such proceedings, provided, however, it shall be open for Arbitral Tribunal to consider and decide whether or not such work should continue during arbitration proceedings.

64.(3) Appointment of arbitrator

64.(3) (a) Appointment of arbitrator where applicability of section 12(5) of Arbitration and Conciliation Act has been waived off:

64.(3)(a)(i) In cases where the total value of all claims in question added together does not exceed Rs.1,00,00,000 (Rupees One Crore only), the Arbitral tribunal shall consist of a sole arbitrator nominated by DFCCIL. The sole arbitrator shall be appointed within 60 days from the day when a written and valid demand for arbitrator is received by DFCCIL.

64.(3)(a)(ii) In cases not covered by the clause 64(3)(a)(i), the Arbitral Tribunal shall consist of a Panel of three officials, as the arbitrators. For this purpose, the DFCCIL will send a panel of at least 4 names of DFCCIL officers which may also include the name(s) of Officer(s) empanelled to work as Arbitrator to the contractor within 60 days from the day when a written and valid demand for arbitration is received by the DFCCIL.

Contractor will be asked to suggest to DFCCIL at least 2 names out of the panel for appointment as contractor's nominee within 30 days from the date of dispatch of the request by Railway /DFCCIL. DFCCIL shall appoint at least one out of them as the contractor's nominee and will, also simultaneously appoint the balance number of arbitrators either from the panel or from outside the panel, duly indicating the 'presiding arbitrator' from amongst the 3 arbitrators so appointed. DFCCIL shall complete this exercise of appointing the Arbitral Tribunal within 30 days from the receipt of the names of contractor's nominees. While nominating the arbitrators it will be necessary to ensure that one of them is from the Accounts department. An officer of selection grade of accounts department shall be considered of equal status to the officers in SA grade of other department of DFCCIL for the purpose of appointment of arbitrator.

64.(3)(b) Appointment of Arbitrator where applicability of section 12 (5) of A&C Act has not been waived off:

The Arbitral Tribunal shall consist of Panel of three (3) retired DFCCIL Official, retired not below the rank of CGM/GM, as the arbitrators. For this purpose, the DFCCIL will send a panel of at least four (4) names of retired DFCCIL Officer(s) empanelled to work as DFCCIL Arbitrator duly indicating their retirement date to the contractor within 60 days from the day when a written and valid demand for arbitration is received by the CGM/GM.

Contractor will be asked to suggest to Chief General Manager / General Manager at least 2 names out of the panel for appointment as contractor's nominee within 30 days from the date of dispatch of the request by DFCCIL .The Chief General Manager / General Manager shall appoint at least one out of them as contractor's nominee and will also simultaneously appoint the balance number of arbitrator from amongst the 3 arbitrators so appointed .CGM/GM shall complete this exercise of appointing the Arbitral Tribunal within 30 days from the receipt of the names of

contractor's nominees. While nominating the arbitrators it will be necessary to ensure that one of them has served in the Accounts Department

64(3)(c)(i): If one or more of the arbitrators appointed as above refuses to act as arbitrator, withdraws from his office as arbitrator, or vacates his/their office/offices or is unable or unwilling to perform his functions as arbitrator for any reason whatsoever or dies or in the opinion of Chief General Manager / General Manager fails to act without undue delay, the Chief General Manager / General Manager shall appoint new arbitrator/arbitrators to act in his/their place in the same manner in which the earlier arbitrator/arbitrators had been appointed. Such re-constituted Tribunal may, at its discretion proceed with the reference from the stage at which it was left by the previous arbitrator (s).

64 (3)(c)(ii):

(a) The arbitrator Tribunal shall have power to call for such evidence by way of affidavits or otherwise as the Arbitral Tribunal shall think proper, and shall be the duty of the parties hereto to do or cause to be done all such things as may be necessary to enable the Arbitral Tribunal to make the award without the delay. The proceedings shall normally be conducted on the basis of document and written statements.

(b) Before proceeding into the merits of any dispute, the Arbitral Tribunal shall first decide and pass its orders over any plea submitted/objections raised by any party, if any regarding appointment of Arbitral Tribunal, validity of arbitration agreement, jurisdiction and scope of the Tribunal to deal with the dispute(s) submitted to arbitration, applicability of time 'limitation' to any dispute ,any violation of agreed procedure regarding conduct of the arbitral proceedings or plea for interim measures of protection and record its orders in day to day proceedings. A copy of the proceedings duly signed by all the members of tribunal shall be provided to both the parties.

64 (3)(c)(iii): (i) Qualification of Arbitrator(s)

(a) Serving Gazetted Railway/DFCCIL Officers of not below JA Grade level
(b) Retired Railway officers/DFCCIL not below SA Grade level, three years after his date if retirement.
(c) Age of arbitrator at the time of appointment shall be below 70 years.

(ii) An arbitrator may be appointed notwithstanding the total number of arbitration cases in which he has been appointed in the past.

(iii) While appointing arbitrator(s) under Sub-Clause 64. (3)(a)(i), 64. (3)(a)(ii) & 64.(3)(b) above, due care shall be taken that he/they is/are not the one/those who had the opportunity to deal with the matters to which the contract relates or who in the course of his/her duties as Railway/DFCCIL servant(s) expressed views on all or any of the matters under dispute or differences. The proceedings of the Arbitral Tribunal or the award made by such Tribunal will, however, not be invalid

merely for the reason that one or more arbitrator had, in course of his service, opportunity to deal with the matters to which the contract relates or who in the course of his/their duties expressed views on all or any of the matters under dispute.

64(3)(d)(i): The arbitral award shall state item wise the sum and reasons upon which it is based. The analysis and reasons shall be detailed enough so that the award could be inferred therefrom.

64(3)(d)(ii): A party may apply for corrections of any computational errors, any typographical or clerical errors or any other error of similar nature occurring in the award of a Tribunal and interpretation of a specific point of award to Tribunal within 60 days of receipt of the award.

64(3)(d)(iii): A party may apply to Tribunal within 60days of receipt award to make an additional award as to claims presented in the arbitral proceedings but omitted from the arbitral award.

64.(4) In case of the Tribunal, comprising of three Members, any ruling on award shall be made by a majority of Members of Tribunal. In the absence of such a majority, the views of the Presiding Arbitrator shall prevail.

64.(5) Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period till the date on which the award is made.

64.(6)(a) The cost of arbitration shall be borne by the respective parties. The cost shall inter-alia include fee of the arbitrator(s), as per the rates fixed by the DFCCIL from time to time and the fee shall be borne equally by both the parties, provided parties sign an agreement in the format given below to these conditions after/while referring these disputes to Arbitration. Further, the fee payable to the arbitrator(s) would be governed by the instructions issued on the subject by DFCCIL from time to time irrespective of the fact whether the arbitrator(s) is/are appointed by DFCCIL or by the court of law unless specifically directed by Hon'ble court otherwise on the matter.

(b)(i) Sole Arbitrator shall be entitled to 25% extra fee over the fee prescribed by DFCCIL from time to time.

(b)(ii) Arbitrator shall be entitled to 50% extra fee if Award is decided within six months.

64(7) Subject to the provisions of the aforesaid Arbitration and Conciliation Act 1996 and the rules and relevant para of General Conditions of Contract (GCC) and any statutory modifications thereof shall apply to the appointment of arbitrators and arbitration proceedings under this clause.

Agreement towards Waiver under Section 12 (5) and Section 31-A (5) of · Arbitration and Conciliation (Amendment) Act

I/we: .....: .....: (Name of · agency/contractor) with reference to agreement no .....: raise disputes as to the construction and operation of this contract, or the respective rights and liabilities, withholding of certificate and demand arbitration in respect of following claims:

Brief of claim:
(i) Claim 1- Detailed at Annexure-
(ii) Claim 2 -
(iii) Claim 3-

I/we ..... (post of Engineer) with reference· to agreement no..... hereby raise disputes as to the construction and operation of this contract, or the respective rights and liabilities, withholding of certificate and demand arbitration in respect of following claims:

I/we ..... do/do not agree to waive off applicability of section 12 (5) of Arbitration and Conciliation (Amendment) Act.

Signature of Claimant __ _____ Signature of Respondent _____

Agreement under Section 31(5)

I/we..... (name of claimant) with reference to agreement no. ..... hereby waive off the applicability of sub section 31-A (2) to 31-A (4) of the Arbitration and Conciliation (Amendment) Act. We further agree that the cost of arbitration will be shared by the parties as per Clause 64 (6) of GCC.

Signature of Claimant __ _____ Signature of Respondent _____

*Strike out whichever not applicable.

Certification by Arbitrators appointed under Clause 63 & 64 of Indian Railways General Conditions of Contract

1. Name:

2. Contact Details:

3. Prior experience (Including Experience with Arbitrations) :

4. I do not have more than five on-going Arbitration cases with me.

5. I hereby certify that I have retired from Railways w.e.f. and empanelled as Railway Arbitrator as per 'The Arbitration and Conciliation Act- 1996'.

6. I have no any past or present relationship in relation to the subject matter in dispute, whether financial, business, professional or other kind.

   Or

   I have past or present relationship in relation to the subject matter in dispute, whether financial, business, professional or other kind. The list of such interests is as under;

7. I have no any past or present relationship with or interest in any of the parties ·whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to my independence or impartiality in terms of The Arbitration and Conciliation Act-1996.

   Or

   I have past or present relationship with or interest in any of the parties whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to my independence or impartiality in terms of The Arbitration and Conciliation Act-1996. The details of such relationship or interests are as under;

8. There are no concurrent Circumstances which are likely to affect my ability to devote sufficient time to the arbitration and in particular to finish the entire arbitration within twelve months.

   Or

   There are Circumstances which are likely to affect my ability to devote sufficient time to the arbitration and in particular to finish the entire arbitration within twelve months. The list of such circumstances is as under;

JOINT VENTURE (JV) FIRMS IN WORKS TENDERS

65.0 **Participation of Joint Venture (JV) Firms in Works Tender:** This Clause shall be applicable for works tenders of value as approved and communicated by Railway Board /DFCCIL from time to time.

65.1 Separate identity / name shall be given to the Joint Venture Firm.

65.2 Number of members in a JV Firm shall not be more than three.

65.3 A member of JV Firm shall not be permitted to participate either in individual capacity or as a member of another JV Firm in the same tender.

65.4 The tender form shall be purchased and submitted only in the name of the JV Firm and not in the name of any constituent member.

65.5 Earnest Money Deposit (EMD) shall be deposited by JV or authorized person of JV through e-payment gateway or as mentioned in tender document.

65.6 One of the members of the JV Firm shall be its Lead Member who shall have a majority (at least 51%) share of interest in the JV Firm and also, must have satisfactorily completed in the last three previous financial years and the current financial year upto the date of opening of the tender, one similar single work for a minimum value as defined in technical eligibility criteria. The other members shall have a share of not less than 20% each in case of JV Firms with upto three members. In case of JV Firm with foreign member(s), the Lead Member has to be an Indian Firm with a minimum share of 51%.

65.7 A copy of Memorandum of Understanding (MoU) executed by the JV members shall be submitted by the JV Firm along with the tender. The complete details of the members of the JV Firm, their share and responsibility in the JV Firm etc. particularly with reference to financial, technical and other obligations shall be furnished in the MOU. (The MOU format for this purpose is enclosed along with the tender, Form No. 9).

65.8 Once the tender is submitted, the MoU shall not be modified / altered / terminated during the validity of the tender. In case the tenderer fails to observe/comply with this stipulation, the full Earnest Money Deposit (EMD) shall be liable to be forfeited.

65.9 Approval for change of constitution of JV Firm shall be at the sole discretion of the Employer (Railways / DFCCIL). The constitution of the JV Firm shall not be allowed to be modified after submission of the tender bid by the JV Firm, except when modification becomes inevitable due to succession laws etc. and in any case the minimum eligibility criteria should not get vitiated. However, the Lead Member shall continue to be the Lead Member of the JV Firm. Failure to observe this requirement would render the offer invalid.

65.10 Similarly, after the contract is awarded, the constitution of JV Firm shall not be allowed to be altered during the currency of contract except when modification become inevitable due to succession laws etc. and in any case the minimum eligibility criteria should not get vitiated. Failure to observe this stipulation shall be deemed to be breach of contract with all consequential penal action as per contract conditions.

65.11 On award of contract to a JV Firm, a single Performance Guarantee shall be submitted by the JV Firm as per tender conditions. All the Guarantees like

Performance Guarantee, Bank Guarantee for Mobilization Advance, Machinery Advance etc. shall be accepted only in the name of the JV Firm and no splitting of guarantees amongst the members of the JV Firm shall be permitted.

65.12 On issue of LOA (Letter Of Acceptance), an agreement among the members of the JV Firm (to whom the work has been awarded) shall be executed and got registered before the Registrar of the Companies under Companies Act or before the Registrar/Sub-Registrar under the Registration Act, 1908. This JV Agreement shall be submitted by the JV Firm to the Railways/ DFCCIL before signing the contract agreement for the work. In case the tenderer fails to observe/comply with this stipulation, the full Earnest Money Deposit (EMD) shall be forfeited and other penal actions due shall be taken against partners of the JV and the JV. This Joint Venture Agreement shall have, inter-alia, following Clauses:

65.12.1 Joint and Several Liability - Members of the JV Firm to which the contract is awarded, shall be jointly and severally liable to the Employer (Railways /DFCCIL) for execution of the project in accordance with General and Special Conditions of Contract. The JV members shall also be liable jointly and severally for the loss, damages caused to the Railways / DFCCIL during the course of execution of the contract or due to non-execution of the contract or part thereof.

65.12.2 Duration of the Joint Venture Agreement - It shall be valid during the entire currency of the contract including the period of extension, if any and the defect liability period after the work is completed.

65.12.3 Governing Laws - The Joint Venture Agreement shall in all respect be governed by and interpreted in accordance with Indian Laws.

65.13 Authorized Member - Joint Venture members shall authorize one of the members on behalf of the Joint Venture Firm to deal with the tender, sign the agreement or enter into contract in respect of the said tender, to receive payment, to witness joint measurement of work done, to sign measurement books and similar such action in respect of the said Tender/contract. All notices/correspondences with respect to the contract would be sent only to this authorized member of the JV Firm.

65.14 No member of the Joint Venture Firm shall have the right to assign or transfer the interest right or liability in the contract without the written consent of the other members and that of the employer (Railways/DFCCIL) in respect of the said tender/contract.

65.15 Documents to be enclosed by the JV Firm along with the tender:

65.15.1 In case one or more of the members of the JV Firm is/are partnership firm(s), following documents shall be submitted:

(a) Notary certified copy of the Partnership Deed,

(b) Consent of all the partners to enter into the Joint Venture Agreement on a stamp paper of appropriate value (in original).

(c) Power of Attorney (duly registered as per prevailing law) in favour of one of the partners of the partnership firm to sign the JV Agreement on behalf of the partnership firm and create liability against the firm.

65.15.2 In case one or more members is/are Proprietary Firm or HUF, the following documents shall be enclosed:

Affidavit on Stamp Paper of appropriate value declaring that his/her Concern is a Proprietary Concern and he/she is sole proprietor of the Concern OR he/she is in position of "KARTA" of Hindu Undivided Family (HUF) and he/she has the authority, power and consent given by other partners to act on behalf of HUF.

65.15.3 In case one or more members is/are limited companies, the following documents shall be submitted:

(a) Notary certified copy of resolutions of the Directors of the Company, permitting the company to enter into a JV agreement, authorizing MD or one of the Directors or Managers of the Company to sign JV Agreement, such other documents required to be signed on behalf of the Company and enter into liability against the company and/or do any other act on behalf of the company.

(b) Copy of Memorandum and Articles of Association of the Company.

(c) Power of Attorney (duly registered as per prevailing law) by the Company authorizing the person to do/act mentioned in the para (a) above.

65.15.4 Deleted.

65.16 Credentials & Qualifying Criteria: Technical and financial eligibility of the JV Firm shall be adjudged based on satisfactory fulfillment of the following criteria:

65.16.1 Technical Eligibility Criteria: As defined in Preamble and General Instructions to tenderers.

65.16.2 Financial Eligibility Criteria: As defined in Preamble and General Instructions to tenderers.

SPECIAL CONDITIONS OF CONTRACT

PART - I
CHAPTER - V

SPECIAL CONDITIONS OF CONTRACT

1.5.1 This Tender shall be governed by Preamble and General instructions to tenderers, General condition of Contract, Special conditions of contract, Technical Specifications, Additional Technical specifications (if any), Drawings, Forms, Annexures, etc.

1.5.2 If there are varying or conflicting provisions in the documents forming part of the contract, Engineer shall be deciding authority with regard to the intentions of the provision and decision of Engineer will be final and binding on the contractor.

1.5.3 **Scheme of work: -** Within a period of 30 days beginning from the date of issue of Letter of Acceptance of Tender, the Contractor shall submit the detailed time schedule for execution of work and various documents enumerated in tender papers to the employer.

1.5.4 Quality Assurance Plan for Substructure and foundation

All materials used in the work shall be of the best quality as per codes. Quality Assurance Plan shall include for materials used and for workmanship of work. The contractor shall submit Quality Assurance Plan for the substructure and foundation. The contractor shall also ensure that the Employer's prescribed Quality Assurance Standards are rigidly followed in for the construction of substructure and foundation. These are to be approved from the client / DFCCIL

1.5.5 Quality Assurance Plan for Superstructure including bearings

(a) All materials used in the work shall be of the best quality as per codes / Specifications for fabrication and erection of steel girder bridges (B1-2001) amended till date. Quality Assurance Plan shall include for materials used and for workmanship of work. Quality Assurance Plan shall also be prepared for erection of girder and casting of deck slab. The contractor shall submit Quality Assurance Plan for the superstructure and bearing. The contractor shall also ensure that the Employer's prescribed Quality Assurance Standards are rigidly followed for the construction of superstructure including bearing. Since, the superstructure is Composite Plate girder/Open Web Girder designed by RDSO / RITES, Quality Assurance Plan shall be in line with Quality Assurance

plans prepared by RDSO for Composite Plate girder/Open Web Girder and POT & POT-PTFE bearings. These plans are to be approved from the DFCCIL.

(b) The contractor shall ensure quality at all necessary points, whether at manufacturer's works, or in his depot or at work site as well as during erection through Quality Assurance Plan.

(c) The Contractor shall adopt a suitable Quality Assurance Programme according to approved instructions, drawings, specifications, etc.

(d) The erection scheme of Composite plate girder/ Open Web Girder shall be approved by DFCCIL before start of erection of girder.

(e) Fabrication of Composite plate girder/ Open Web Girder will be inspected by DFCCIL's Engineer in Charge / RDSO / PMC's representative.

1.5.6 **Expenses of Engineer's Representative** – All the expenses of Engineer's representative shall be borne by the DFCCIL whether the inspected material is finally utilised in work or not.

1.5.7 The decision of the Engineer shall be final in respect of acceptability or otherwise of any material, fittings, component or equipment required for the work.

1.5.8 This programme of the Contractor shall generally cover the followings: -

1.5.8.1 The organization to manage and implement the Quality Assurance programme.

1.5.8.2 The documentation control system:

(i) Basic control system.

(ii) Adopted at manufacturer's work

(iii) Adopted at the Contractor Depot and work site.

1.5.8.3. Procedure adopted for:

(i) Source Inspection.

(ii) Incoming raw material inspection.

(iii) Verification of material purchased.

(iv) Fabrication Controls.

(v) Site erection controls.

1.5.8.4 Inspection and Test Procedure for:

(i) Manufacture and quality control procedure.

(ii) Field activity.

1.5.8.5 System of handling and storage.

1.5.8.6 System of quality audit.

1.5.8.7 System of maintenance of records.

1.5.8.8 For the purpose of obtaining 'On Account Payment', the Contractor shall submit along with the invoice, the documents indicated in the prescribed quality Assurance standards which should inter alia cover the following as may be applicable in each case.

(i) Material test reports on raw materials used.

(ii) Material type and routine test report on components specification.

(iii) Inspection Plan with reports of the inspection Plan check points.

(iv) Routine test report.

(v) Factory test results as required under the specification.

(vi) Quality audit report including test check report of Employer's representative if any.

1.5.9 Traffic Blocks / Power Blocks / Shut Down:

(a) The contractor shall obtain Power / Traffic / Shut down in the name of authorized representative of DFCCIL. Engineer/Engineer's representative will facilitate to make arrangements to obtain power blocks / shutdown (hereinafter referred to as blocks) for works to be carried out along or adjacent to the track work. Works such as foundations of abutments/piers shall generally be done without blocks. However, if block is required due to safety considerations, the construction shall be done under block. The requirement of shut down, power blocks etc. shall be assessed by the contractor and will be submitted to the Engineer/Engineer's representative. All the erection of girders etc. shall be done under minimum power block/shut down. Contractor will arrange minimum two gangs of labours i.e. expert of TR line fitters,

Semi-skilled fitters, labours etc. with supervisors and sufficient tools and tackles required as per site conditions. Work will be done day & night with war foot level with the approval of the Engineer/Engineer's representative.

(b) Blocks will be granted during day & night hours continuous. The Contractor shall confirm that he will equip himself to carry out all construction during night blocks efficiently by suitable special lighting equipments without any extra cost.

(c) Block period shall be counted from the time the TR-line is placed at the Contractor's disposal at the work-spot till it is cleared by the Contractor.

(d) Blocks will be subject to normal operating conditions and rules of the Railway. All formalities of exchanging private number etc with the traffic control/traction power controller will be carried out by the Engineer staff and for this purpose the Engineer will depute a representative for each ROB, who will be responsible for imposing power blocks/shut down and also removing the same after men, material and equipment have been cleared by the Contractor from running tracks and the same declared safe for traffic by Engineer/Engineer's representative in case of works involving safety of running tracks.

(e) The works required to be done under traffic block shall be carried out only in the presence of DFCCIL officials. The Railway supervisor shall certify safe conditions for passage of trains before resumption of traffic. The works to be done under traffic block shall be carried out under the provision of banner flag and protection of engineering flagman.

(f) Any charges which may be levied by IR on account of "Possessions" shall be payable by the contractor but shall be reimbursed by the Employer**.** However, penalties, if any, levied by Indian Railways caused due to any careless working or otherwise of violation of the Terms and Conditions of the traffic block, shall be payable by the contractor.

1.5.10 Work by Other Agencies

(a) Any other works undertaken at the same time by the Engineer direct or through some other agency at the same time or section where the contractor is carrying out his work will not entitle the contractor to prefer any claim regarding any delays or hindrances he may have to face on this account but the Employer shall grant a reasonable extension of time to the contractor. The contractor shall comply with any instruction which may be given to him by the Employer in order to permit simultaneous execution of his own works and those undertaken by other contractors or the DFCCIL without being entitled on this account on any extra charge.

(b) The contractor shall not be entitled to any extra payment due to hindrance resulting from normal Railway operations, risk such as delay on account of adequate number of and duration of blocks not being granted, operational delay in movement of work trains extension of time to the contractor.

1.5.11 Infringement of patents:

(a) The Contractor is forbidden to use any patents or registered drawings, process or pattern in fulfilling his contract without the previous consent in writing of the owner of such patent, drawing, pattern or trade mark, except where these are specified by the Employer himself. Royalties where payable for the use of such patented processes, registered drawings of patterns shall be borne exclusively by the Contractor. The contractor shall advise the Employer of any proprietary right that may exist on such processed drawings or patterns which he may use of his own accord.

(b) In the case of patent taken out by the Contractor of the drawings or patterns registered by him, or of those patents, drawings, or patents for which he holds a licence, the signing of the Contract automatically gives the Employer the right to repair by himself the purchased articles covered by the patent or by any person or body chosen by him and to obtain from any sources he desires the component parts required by him in carrying out the repair work. In the event of infringement of any patent rights due to above action of the Employer, he shall be entitled to claim damages from the contractor on the grounds of any loss of any nature which he may suffer e.g. in the case of attachment because of counterfeiting.

(c) **Indemnification by contractor:-** In the event of any claim or demand being made or action being brought against the Employer for infringement of later patent in respect of any equipment, machine, plant, work or thing used or supplied by the Contractor under this contract or in respect of any methods of using or working by the Employer of such equipment machine, plant work or thing, the contractor shall indemnify the employer and keep him indemnified and harmless against all claims, costs, charges and expenses arising from or incurred by reason of such claim provided that the Employer shall notify the contractor immediately any claim is made and that the contractor shall be at liberty, if he so desires with the assistance of the Employer if required but at the Contractor's expense, to conduct all negotiations for the settlement of the same or any litigation that may arise there from and provided that no such equipment, machine, plant work or thing, shall be used by the Employer for any purpose or in any manner other than that for which they have been supplied by the Contractor and specified under this contract.

1.5.12 Insurance: - (Contractors' All Risk policy)

Before commencing of works, it shall be obligatory for the contractor to obtain, at his own cost, insurance cover in the joint name of the contractor and employer from reputed companies under the following requirements:

(a) Liability for death of or injury to any person/ employer's staff / animals or things or loss of or damage to any property / things / the work of other contractor (other than the work) arising out of the performance of the Contract.

(b) Construction Plant, Machinery and equipment brought to site by the Contractor.

(c) Any other insurance cover as may be required by the law of the land.

The contractor shall provide evidence to the employer / Engineer before commencement of work at site that the insurances required under the contract have been effected and shall within 60 days of the commencement date, provide the insurance policies to the Employer/Engineer, the contractor shall, whenever, called upon, produce to the engineer or his representative the evidence of payment of premiums paid by him to ensure that the policies indeed continue to be in force.

The Contractor shall also obtain any additional insurance cover as per the requirements of the Contract.

The Employer/Engineer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or his sub-contractor or petty contractor / other contractor working there. The Contractor shall indemnify and keep indemnified the employer / Engineer against all such damages and compensation for which the contractor is liable.

The Policies of the contractor shall remain in force throughout the period of execution of the works and till the expiry of the defect liability period except for any specific insurance covers necessary for shorter period.

If the Contractor fails to effect or keep in force or provide adequate cover as acceptable to the engineer in the insurance policies mentioned above, then in such cases, the engineer may effect and keep in force any such insurance or further insurance on behalf of the Contactor. The recovery shall be made at the rate of 1.5 times the premium/premiums paid by the engineer in this regard from the payment due to the Contractor or from the contractor's Performance security. However, the Contractor shall not be absolved from his responsibility and /or liability in this regard.

1.5.13 Accident: -

(a) The contractor shall, in respect of all staff engaged by him or by his sub-contractor, indemnify and keep the employer at all times indemnified and protected against all claims made and liabilities incurred under Workman's Compensation Act, the Factories Act and the Payment of Wages Act, and rules made there under from time to time or under any other labour and Industrial Legislation made from time to time.

(b) The contractor shall indemnify and keep the employer indemnified and harmless against all actions, suits, claim demands, costs, charges or expenses arising in connection with any death or injury sustained by any person or persons sustained due to the acts or omission of the contractor, his sub-contractors, his agents or his staff during the executions of this contract irrespective of whether such liability arises under the Workman's Compensation Act, or Fatal Accident Act or any other statute in force for the time being.

(c) The contractor' liability to meet third party claims of the type outlined above will be applicable only in cases where accidents have been caused by workmanship, material, execution or negligence on the part of the contractor and further the liability of the contractor will be limited to Rs. 15 lakhs for any one accident.

(d) The contractor shall be responsible for all repairs and rectification of damages to completed works or works under execution due to Railway /DFCCIL accidents, thefts, pilferage or any other cause, without delay to minimize or to avoid traffic detentions, in a section until the installation are provisionally handed over to the employer.

1.5.14 Safety Measures: -

(a) The contractor shall take all precautionary measures in order to ensure the protection of his own personnel moving about or working on the railway premises, but shall then conform to the rules and regulations of the Railway if and when, in the course of the work there is likely to be any danger to persons in the employment of the contractor due to running traffic while working in the Railway siding and premises, the contractor shall provide flagman or look out men for protection of such persons. The employer shall remain indemnified by the contractor in the event of any accident occurring in the normal course of work, arising out of the failure of contractor or his men to exercise reasonable precaution at all places of work.

(b) Blasting of rocks for foundation work shall be done only after due notice is given to the employer and time/s and date /s for blasting operations agreed to by the employer. Blasting, if required to be done in the vicinity of the track, shall not be undertaken until the Employer's flagmen on duty take necessary step to protect trains and the track is adequately protected by

the contractor against damage by blasted rock. The contractor shall follow detailed instructions which will be issued to him regarding blasting operations in the vicinity of tracks.

(c) The contractor shall abide by all Railway regulations in force for the time being and ensure that the same are followed by his representatives, Agents or sub -contractors or workmen. He shall give due notice to his employees and workers about provision of this para.

(d) The works must be carried out most carefully without any infringement of the Indian Railway Act or the General and Subsidiary Rules in force on the Railway, in such a way that they do not hinder Railway operation or affect the proper functioning of or damage any Railway/DFCCIL equipment, structure or rolling stock except as agreed to by the employer, provided that all damage and disfiguration caused by the contractor will rectify at his own cost failing which cost of such repairs shall be recovered from the contractor.

(e) If safety of track or track drainage etc. is affected as a consequence of works undertaken by the contractor, the contractor shall take immediate steps to restore normal conditions. In case of delay, the employer shall, after giving due notice to the contractor in writing, take necessary steps and recover the costs from the contractor.

1.5.15 Guarantee / Defect Liability Period: -

(a) The Contractor shall guarantee that all the works executed under this contract shall be free from all defects and faults in material, workmanship and manufacture and shall be of acceptable standards for the contracted work and in full conformity with the technical specifications, drawings and other contract stipulations, **for a period of 12 months from the date of taking over by the Employer**

(b) During the period of guarantee the Contractor shall keep available an experienced engineer / man power to attend to any defective works / installations resulting from defective erection and/or defect in the installation supplied by the Contractor. This engineer shall not attend to rectification of defects which arise out of normal wear and tear and come within the purview of routine maintenance work. The contractor shall bear the cost of modifications, additions or substitutions that may be considered necessary due to faulty materials or workmanship for the satisfactory working of the equipment. The final decision shall rest with the Engineer his successor(s)/Nominee.

(c) During the period of Guarantee the Contractor shall be liable for the replacement at site of any parts which may be found defective in the executed work whether such parts / structural elements of his own

manufacture or those of his sub-contractor / supplier whether arising from faulty materials, workmanship or negligence in any manner on the part of the Contractor provided always that such defective parts as are not repairable at site are promptly returned to the Contractor if so required by him at his (Contractor's) own expenses. In case of parts of executed work detected during guarantee period, contractor should replace all such items irrespective of the fact whether all such items have failed or not. The Contractor shall bear the cost of repairs carried out on his behalf by the Employer at site. In such a case, the contractor shall be informed in advance of the works proposed to be carried out by the Employer.

(d) If it becomes necessary for the Contractor to replace or renew any defective portion of the structural elements until the expiration of six months from the date of such replacement or renewal or until the end of the above-mentioned period whichever is later.

Such extension shall not apply in case of defects of a minor nature, the decision of the Chief General Manager / General Manager / ROB, CPM or his successor/nominee being final in the matter. If any defect be not remedied within a reasonable time during the aforesaid period the Employer may proceed to do work at the Contractor's risk and expense, but without prejudice to any other rights and remedies which the Employer may have against the Contractor in respect of such defects or faults.

(e) The repaired or renewal parts structure shall be delivered / supplied and erected / executed on site free of charge to the employer.

(f) Any materials, fittings, components or equipments / structure supplied under items for supplying / providing and fixing in schedule shall also be covered by the provisions of this paragraph. The liability of the Contractor under the guarantee will be limited to re-supply of components / structure installation and fittings.

1.5.16 Final Acceptance: -

(a) The final acceptance of the entire work executed shall take effect from the date of expiry of the period of guarantee / Defect Liability period as defined in paragraph 1.5.15 above of the expiry of the last of the respective periods of guarantee of various ROBs, provided in any case that the Contractor has complied fully with his obligations under clause 1.5.15 in respect of each ROB, provided also that the attention has been paid by way of maintenance by the Employer.

(b) If on the other hand the contractor has not so complied with his obligation under Para 1.5.15 above in respect of any work, the Employer may either extend the period of guarantee in respect of that work until the necessary

works are carried out by the Contractor or carry out those works or got them carried out soul moto on behalf of the Contractor at the Contractor's expenses. After expiry of the period of guarantee for each work, a certificate of final acceptance for the section shall be issued by the Employer and the last of such certificate will be called the last and final acceptance certificate. The contract shall not be considered as completed until the issue of final acceptance certificate by the Employer.

(c) The Employer shall not be liable to the Contractor for any matter arising out of or in connection with the contract or execution of the work unless the Contractor shall have made a claim in writing in respect thereof before the issue of final acceptance certificate under this clause.

Notwithstanding the issue of final acceptance certificate, the Contractor and the Employer (subject to sub-clause as above) shall remain liable for fulfilment of any obligation incurred under the provision of the contract prior to the issue of final acceptance certificate which remains unperformed at the time such certificate is issued and for determining the nature and extent of such obligation the contract shall be deemed to remain in force between the parties hereto.

1.5.17 Payment: -

Payment will be governed by the terms specified in Part-I, Chapter IV and in accordance with accepted schedule of prices, read with relevant para of the other parts and Chapters of the Tender Papers. The employer retains the right to withhold money due to the contractor arising out of this contract for any default of the contractor.

(i) The Contractor shall, whenever required, produce or cause to be produced for examination by the Employer any quotation / invoice, cost of other account, book of account, voucher, receipt letter, memorandum paper or writing or any copy of or extract from any such document and also furnish information and returns verified in such manner as may be required in anyway relating to the execution of this contract or relevant for verifying or ascertaining the cost of the execution of this Contract (the decision of the employer on the question of relevancy of any documents, information or return being final and binding on the parties). The Contractor shall similarly produce vouchers etc., if required, to prove to the Employer that materials supplied by him are in accordance with the specifications laid down in the contract.

(ii) If any portion of the work be carried out by a sub-contractor or any subsidiary or allied firm or company the Employer shall have power to secure the books of such sub-contractor or any subsidiary or allied firm or company,

through the Contractor, and such books shall be open to his inspection. The Contractor should seek prior permission from the employer for subletting whole and/or part of the work to any sub-contractor.

(iii) The obligations imposed by sub-clause (i) and (ii) above are without prejudice to the obligation of the Contractor under any statute, rules or order binding to the Contractor or other conditions of the contract.

(iv) It is an agreed term of the contract that the employer reserves the right to carry out post-payment Audit and/or technical examination of the works and the final bill, including all supporting vouchers, abstracts etc. and to make a claim on the Contractor for the refund of any excess amount paid to him if as a result of such examination any over payment to him is discovered to have been made in respect of any work done or alleged to have been done by him under the contract.

1.5.18 All payments in respect of the contract during the currency of the contract shall be made through Electronic Clearing System (ECS) / National Electronic Funds Transfer (NEFT/RTGS). The successful tenderer on award of contract must submit ECS/NEFT/RTGS Mandate Form complete in all respects as detailed at Form No. 8 of the tender document. However, if the facility of ECS/NEFT/RTGS is not available at a particular location, the payments shall be made by cheque.

1.5.19 Performance Guarantee: -

(i) The Bank Guarantee for performance Guarantee shall remain valid until a date 60 days (or as specified in the Contract) after expiry of Defects Liability Period.

(ii) The Bank Guarantee for performance Guarantee shall be submitted invariably in the format given in the bidding document.

(iii) The performance Guarantee shall be released 21 days after issue of completion certificate and passing of final bill.

1.5.20 Mobilization Advance: - (Applicable for Advertised tender of value more than Rs. 25.00 crore)

(a) Mobilisation advance –

This shall be limited to 10% of the contract value and payable in 2 stages as indicated below:

Stage I - 5% of Contract Value on signing of the contract agreement.

Stage II - 5% on mobilization of site-establishment, setting up offices, bringing in equipment and actual commencement of work.

The 1st stage of advance shall be payable immediately after signing of contract Agreement. The 2nd stage of advance shall be payable at the time of mobilization, after submission of a utilization certificate by the contractor that the stage 1 advance has been properly utilized in the contract.

(b) Advance Against Machinery and Equipment – (NOT APPLICABLE)

(c) Advances for accelerating progress of the work during course of execution of Contract – (NOT APPLICABLE)

(d) Advances in Exceptional Cases – (NOT APPLICABLE)

(e) The above advances are subject to the following conditions –

i. The advance shall carry an interest at the rate 10% per annum as effective on the date of approval of payment of mobilization advance by the Competent Authority, compounded yearly.

ii. Advances except those against machinery and equipment shall be payable against irrevocable guarantee (Bank Guarantee / FDRs / KVRs / NSCs) of at least 110% of the value of the sanctioned advance amount (covering principal plus interest). The Bank Guarantee shall be from a Nationalised / Scheduled Bank in India or State Bank of India in a form acceptable to the Railways/DFCCIL-Tender form-19.

iii. The recovery shall commence when the value of contract executed reaches 15% of original contract value and shall be completed when the value of work executed reaches 85% of the original contract value. The instalments on each “on account bill” will be on pro-rata basis;

iv. That the grant of advance is primarily in Railway’s/ DFCCIL’s own interest;

v. That a contractor does not receive advances for same work from different offices;

vi. That arrangement is made with the Accounts Officer for proper accounts being kept with regard to payment and recovery of these advances; and

vii. That all necessary precautions are taken to secure Government from the possibility of loss and for preventing the system becoming more general or continuing longer than what may be absolutely necessary for proper progress of the work.

(f) Method of Recovery of Interest –

Interest shall be recovered on the advance outstanding for the period commencing from the date of payment of advance till date of particular on-account bill (through which recovery of date of principal is affected) and adjusted fully against on-account bill along with pro-rata principal recovery. In the event of any short-fall, the same shall be carried forward to the next on-account bill and shall attract interest.

The Bank Guarantee for such advance shall clearly cover at least 110% of the value of the sanctioned advance amount (covering principal plus interest).

Note: The instruments as listed under Performance Guarantee vide Clause 16. (4) (b) of General conditions of contract will also be acceptable for Guarantee in case of Mobilisation Advance.

1.5.21 Arbitration: - Refer to clause 63 of GCC.

1.5.22 Integrity Pact: -

As per office memorandum no F. No DPE/13(12)/11-Fin Dated 09.09.2011 issued by Ministry of Heavy Industries (DPE) all PSU should enter into Integrity pact in the required proforma in their procurement transaction/ Contracts with suitable changes specific to the situation in which the pact is to be used. The pact, entering into which would be a preliminary qualification for any bidder, essentially envisages an agreement between the prospective vendors / bidders and the DFCCIL, committing the persons/ officials on both sides not to resort to any corrupt practices in any aspect / stage of the contract.

A copy of pre contract integrity pact is enclosed as Form No. 20 for signature of bidder as acceptance, as and when Independent External monitor is appointed.

1.5.23 Special Clause related to Price Variation clause (46A)

The price variation payment will be released after publication of final indices for quarter under consideration by RBI.

1.5.24 Change in law

“The contract price shall be adjusted to take account of any increase and decrease in cost after the bid submission date resulting from:

a. A change in the law of the country (including the introduction of new laws and the repeal or modification of existing laws): or

b. In the Judicial or official government interpretation of such laws, or

c. The commencement of any Indian law which has not entered into effect until the bid submission date; or

d. Any change in the rates of any of the taxes on supply of materials and services that have a direct effect on the works.

Which affect the contractor in the performance of obligation under the contract.

Further if as a result of change in law, interpretation, or rates of taxes, the contractor benefits from any reduction in the cost for the execution of this contract, save and except as expressly provided for this sub-clause or in accordance with the provisions of this contract, the contractor shall, within 28 days from the date he becomes reasonably aware of such reduction in the cost, notify the employer of such reduction in cost."

1.5.25 Updation of Labour Data on Railway's Shramik kalyan portal

A. Contractor is to abide by the provisions of Payment of Wages act & Minimum Wages act in terms of clause 54 and 55 of Indian Railways General Condition of Contract. In order to ensure the same, an application has been developed and hosted on website "www.shramikkalyan.indianrailways.gov.in". Contractor shall register his firm/company etc. and upload requisite details of labour and their payment in this portal. These details shall be available in public domain. The Registration/Updation of portal shall be done as under:

a) Contractor shall apply for one-time registration of his company/firm etc. in the Shramik kalyan portal with requisite details subsequent to issue of Letter of Acceptance. Engineer shall approve the contractor's registration on the portal within 7 days of receipt of such request.

b) Contractor once approved by any Engineer, can create password with login ID (PAN No.) for subsequent use of portal for all LOAs issued in his favour.

c) The contractor once registered on the portal, shall provide details of his Letter of Acceptances (LOA)/Contract Agreement on Shramikkalyan portal within 15 days of issue of any LOA for approval of concerned Engineer. Engineer shall update (if required) ad approve the details of LOA filled by contractor within 7 days of receipt of such request.

d) After approval of LOA by Engineer, contractor shall fill the salient details of contract labours engaged in the contract and ensure updating of each wage payment to them on Shramik kalyan portal on monthly basis.

e) It shall be mandatory upon the contractor to ensure correct and prompt uploading of all salient details of engaged contractual labour & payments made thereof after each wage period.

B. While processing payment of any 'On Account Bill' or 'Final Bill' or release of 'Advance' or 'performance guarantee/Security deposit', Contractor shall submit a certificate to the Engineer or Engineer's representation that "I Have uploaded the correct details of contract labours engaged in connection with this contract and payments made to them during the wage period in Railway's Shramik kalyan portal at 'www.shramikkalyan.indianrailways.gov.in' till-------Month-----Year."

TECHNICAL SPECIFICATION

PART - II

TECHNICAL SPECIFICATIONS

For technical specifications, refer Indian Railways Unified Standard Specifications (Works and Materials), 2010 amended upto date and the specification for fabrication and erection of steel girder bridges and Locomotive Turn Table (Fabrication Specification), Serial No B1 - 2001 amended upto date.

Indian Railways Unified Standard Specifications (Works and materials), Volume I & II are available for sale at the offices of General Managers and DRMs at all Zonal Railways& Production Units.

2.1 GENERAL GUIDELINES REGARDING SPECIFICATIONS AND SPECIAL CONDITIONS FOR SUPPLY OF CEMENT FOR CONSTRUCTION WORKS

2.1.1 SUPPLY OF CEMENT:

2.1.1.1 Supply of cement to various specifications as required for various items under different schedules will be paid under the items in Schedule.

2.1.1.2 The cement required for various items of work under Schedule shall be supplied by the Contractor at the site of work in accordance with the requirements and specifications.

2.1.1.3 For supply and use of cement in various works, relevant Indian Railways Unified Standard Specifications (Works and Materials), Volume I & II - 2010, IRS codes and IS Specifications will be applicable. Wherever, relevant specifications are not available, decision of the Engineer shall be final and binding on the contractor.

2.1.2 SPECIFICATIONS FOR CEMENT:

2.1.2.1 The cement used shall conform to any of the following standards.

(i) 33 Grade Ordinary Portland Cement conforming to IS: 269

(ii) 43 Grade Ordinary Portland Cement conforming to IS: 8112

(iii) 53 Grade Ordinary Portland Cement conforming to IS: 12269

(iv) Rapid Hardening Ordinary Cement conforming to IS: 8041

(v) High Strength Portland Cement conforming to IRS: T: 40

(vi) Hydrophobic Portland cement conforming to IS: 8043

(vii) Low heat Portland cement conforming to IS: 12600

(viii) Sulphate Resistance Cement conforming to IS: 12330

2.1.3 SOURCE AND PACKAGING:

2.1.3.1 Cement to be used on the works shall be procured from the main / reputed cement plants or from their authorized dealers. Decision of DFCCIL regarding reputed firms shall be final and binding on the contractor.

2.1.3.2 Cement shall be packed in jute sacking bags conforming to IS: 2580-1982, double hessian bituminised (CRI type) or woven HDPE conforming to IS:11652-1986, woven polypropylene conforming to IS: 11653:1986, Jute synthetic union conforming to IS: 12174:1987or any other approved composite bags, bearing the following information in legible markings:

(i) Manufacturer's name or Registered Trade Mark of manufacturer, if any.

(ii) Grade of cement

(iii) Type of cement

(iv) Weight of each bag in Kg.

(v) Date of manufacture,

(vi) IS Code No. to which the cement conforms

2.1.3.3 All cement bags shall have company stitches intact and if any sign of tampering with company stitches is noticed, the same will be rejected without any test and no compensation shall be payable in this regard.

2.1.4 TEST CERTIFICATE REGARDING QUALITY OF CEMENT:

2.1.4.1 Necessary test certificates will have to be produced by the contractor regarding the quality of the cement conforming to the specification in addition to the manufacturer's certificates.

2.1.4.2 DFCCIL reserves the right to take samples during the course of the work and get the cement tested in reputed laboratories to ascertain the conformity to the specification. Cost of such testing shall be borne by the contractor without any extra payment.

2.1.4.3 Tests on cement shall be done as per relevant IS Codes. These tests are as follows:

(i) Compressive strength.

(ii) Initial and final setting time.

(iii) Consistency.

(iv) Soundness.

(v) Fineness.

2.1.4.4 The Contractor shall arrange to carryout above tests for every 100 Tonnes of cement and for every change in lot/batch and the same shall be submitted to the DFCCIL and take approval of the DFCCIL before using in work. No extra payment will be made for conducting such tests.

2.1.4.5 Any temporary structure required for storage of cement, has to be provided by the tenderer at his cost and shall be removed after completion of work. The DFCCIL will only provide suitable land wherever land is available and is free for use. On completion of the work or as directed by the Engineer, the shed if put up by the Contractor, should be removed by the contractor and site cleared at his cost.

2.1.5 CONSUMPTION OF CEMENT:

2.1.5.1 The cement consumption for other than design mix concrete, shall be as per North Central Railway Unified Standard Schedule of Rates (Works and Materials), Engineering Department - 2010 and for approved design mix concrete, the quantity of cement will be decided based on the approved design mix keeping in mind Minimum and Maximum cement content specified for various grades. Excess cement used will not be paid for and the decision of the Engineer in this connection shall be final and binding on the Contractor.

2.1.6 PAYMENT FOR CEMENT: -

Cement supplied for the work and measured under the Schedule will be paid only after its use in various works under the Schedules of the contract as per conditions and no advance payment for supply will be admissible.

2.1.7 GENERAL: -

2.1.7.1 No wastage of any of the materials supplied and used in the work by the contractor including cement is payable by DFCCIL, contractor shall make his own arrangements for storing cement for use in work.

2.1.7.2 Contractor should take proper precautionary measures to store the cement in good condition against rains, etc. Storage of cement at the work site shall be at the contractor's expense and risk. Any damage occurring to cement due to faulty

storage in contractor's shed or on account of negligence on his part shall be the liability of the contractor.

2.1.7.3 53 Grade/43 Grade of cement should be stacked separately in countable manner.

2.1.7.4 Admixture as per IS: 9103 of approved manufacturer by the Engineer shall be permitted to be used in concrete wherever required. However, no extra payment for the admixtures used shall be payable unless otherwise specified in the Schedule.

2.1.7.5 Cement for temporary and enabling works shall be arranged by the contractor at his own cost and no extra payment will be paid on this account.

2.1.7.6 Empty Cement bags on release from the work is the property of the Contractor and shall be disposed off by the Contractor himself.

2.2 GENERAL GUIDELINES REGARDING SPECIFICATIONS AND SPECIAL CONDITIONS FOR CONCRETE WORKS

2.2.1 Specifications: -

2.2.1.1 Concrete for PCC, RCC (Including piling and RCC deck slab) shall be as per relevant Indian Railway Unified Standard Specifications (Works & Materials) Volume I & II, Engineering Department, 2010 and IS Specifications. Some important guide lines are listed below. Along with these, all other relevant IRS, IRC and IS specifications with their up to date versions shall also govern. These govern all concrete works in bridges, etc. as applicable.

(i) IRS Concrete Bridge Code.

(ii) IS 456: Code of Practice for Plain and Reinforced Concrete.

(iii) Relevant Indian Railway Unified Standard Specifications (Works & Materials) Volume I & II, Engineering Department, 2010.

(iv) Relevant IRS/IRC/IS Specifications/Codes.

2.2.1.2 Specifications for cement, steel, GI binding wire, used in concrete construction shall be as per IRS/IRC/IS specifications. Any other specifications/rules/guidelines issued from time to time by Railway Board/RDSO shall also govern the works.

2.2.1.3 In all matters of execution, including testing of various components, where the above codes/specifications/guidelines are not clear or explicit or at variance, the directions given by the Engineer shall be final and binding on the contractor.

2.2.2 Cement: -

2.2.2.1 The cement used in concrete construction shall be minimum 43 Grade Ordinary Portland cement as per the design and as specified in the relevant schedules. Specifications for cement are covered under the supply schedule.

2.2.3 Reinforcement: -

2.2.3.1 All Reinforcement Steel (TMT Bars of Grade Fe 500 D/550D) shall be procured as per specification mentioned in IS: 1786. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the Specifications.

These steel shall be procured only from those firms, which are Established, Reliable, Indigenous & Primary Producers of Steel, having Integrated Steel Plants (ISP), using iron ore as the basic raw material and having in – house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's guidelines.

2.2.3.2 Bars shall be cut, bent and placed correctly and accurately to the size and shape as shown in the detailed drawing. Preferably bars of full length shall be used. The reinforcement shall be tied with annealed steel binding wire. Overlapping of bars, where necessary, shall be done as directed by Engineer. Rates quoted include the cost of annealed steel binding wire of appropriate specifications. Rate also include necessary cutting and straightening is also included.

2.2.3.3 Welding of reinforcement will not be generally permitted except in special circumstances under the written approval of the Engineer.

2.2.3.4 A register shall be maintained by the Contractor with full details of reinforcement provided for accountal and payment of steel reinforcement. The contractor should sign a similar such register maintained by DFCCIL before undertaking concreting works, as a token of acceptance of the details of reinforcement steel provided in works, failing which the details as recorded by DFCCIL shall be binding on the contractor for the purpose of payment and no dispute will be entertained by DFCCIL on this account.

2.2.3.5 Contractor shall remove from site any steel materials rejected by the Engineer within a reasonable time as specified by him.

2.2.3.6 Protective Coatings: - In order to offer adequate resistance against corrosion, reinforcement bars may be provided with suitable protective coatings depending upon the environmental conditions in aggressive environments (severe, and extreme) application of cement slurry coating after removal of rust and other loose material from the surface of the reinforcement bar will generally be sufficient.

2.2.3.7 The steel consumption shall be as per the drawings issued by the DFCCIL. Quantity of steel reinforcement consumption shall be as per reinforcement actually utilized in the work based on approved bar bending schedule. Nothing extra will be paid for wastage or for cut rods, if any, which will be property of the contractor. The weight of the steel will be calculated from the nominal weight given in the producer's hand / IRUSS (W & M), 2010-Volume-I books.

2.2.4 Coarse & Fine Aggregates: -

2.2.4.1 Aggregates shall comply with the requirements of IS: 383 and shall be subjected to the tests in accordance with IS: 2386. Coarse aggregates shall be from crushed stone from approved quarries. Sand shall be from good river sources of approved quarries only.

2.2.4.2 The size of the coarse aggregates shall be as per relevant IRS / IS specifications.

2.2.4.3 The size of the fine aggregates shall be as per relevant IRS / IS specifications.

2.2.4.4 Coarse aggregate shall be crushed and roughly cubical in shape. Fine aggregate shall be naturally produced. Creek/ Marine sand shall not be used in permanent works.

2.2.4.5 The grading of the sand shall conform to relevant IS specification. The sand shall be screened on a 4.75 mm size screen to eliminate over size particles. The sand, if required, shall be washed in screw type mechanical washers in potable water to remove excess silt, clay and chlorides wherever required. The screening and washing of sand shall be completed at least one day before using it in concrete. The washed sand shall be stored on a sloping platform and in such a manner as to avoid contamination.

2.2.5 Water: -

2.2.5.1 Water used for washing of aggregates and for mixing and curing concrete shall be clean, potable and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel and shall conform to clause 5.4 of IS: 456.

2.2.5.2 In case of doubt regarding development of strength, the suitability of water for making concrete shall be ascertained by the compressive strength as per IS: 4031 (Part VI) and initial setting time tests IS: 4031 (Part V).

2.2.5.3 Water found satisfactory for mixing is also suitable for curing concrete. However, water used for curing should not produce any objectionable stain or unsightly deposit on the concrete surface. The presence of tannic acid or iron compounds is objectionable.

2.2.6 Admixtures: -

2.2.6.1 In bridges, use of admixtures is governed by clause 4.4 of IRS Concrete Bridge Code.

2.2.6.2 The admixtures, when permitted, shall conform to IS: 9103.Calcium chloride or admixtures containing calcium chloride shall not be used in structural concrete containing reinforcement, prestressing tendon or other embedded metal. The admixture containing Cl& SO3 ions shall not be used. Admixtures containing nitrates shall also not be used. Admixtures based on thiocyanate may promote corrosion and therefore shall be prohibited.

2.2.6.3 Concrete admixtures shall be obtained only from established manufactures with proven track record or as per approved list wherever available.

2.2.6.4 The contractor shall provide the following information concerning each admixture after obtaining the same from the manufacturer before the same is put to use:

(a) The chemical names of the main ingredients in the admixtures.

(b) The chloride iron content, if any, expressed as a percentage by mass of the total admixture.

(c) Values of dry material content, ash content and relative density of the liquid admixture which can be used for Uniformity Tests.

(d) Whether or not the admixture leads to the entrainment of air when used as per the manufacturer's recommended dosage, and if so to what extent.

(e) Where two or more admixtures are proposed to be used in any one mix, confirmation as to their compatibility.

(f) There would be no increase in risk of corrosion of the reinforcement or other embodiments as a result of using the admixture.

(g) Retardation achieved in initial setting time.

(h) Normal dosage and detrimental effects, if any, of under dosage and over dosage.

(i) Recommended dosages and expected results, including proof for the same wherever required. Independent test results shall be produced by the contractor on demand/as specified.

2.2.7 Storage of materials: -

2.2.7.1 Storage of materials shall be as per IS: 4082. All materials may be stored at proper places so as to prevent their deterioration or intrusion by foreign matter and to ensure their satisfactory quality and fitness for the work. The storage space must also permit easy inspection, removal and restoring of the materials. All such materials even though stored in approved godowns / places, must be subjected to acceptance test prior to their immediate use.

2.2.7.2 Aggregate shall be stored at site on a hard and dry level patch of ground. If such a surface is not available, a platform of planks or of corrugated iron sheets, or a floor of dry bricks, or a thin layer of lean concrete shall be made so as to prevent the admixture of clay, dust, vegetable and other foreign matter.

Stacks of fine and coarse aggregate shall be kept in separate stack piles, sufficiently removed from each other to prevent the materials at the edge of the piles getting intermixed. On a large job it is desirable to construct dividing walls to give each type of aggregate its own compartment. Fine aggregate shall be stacked in place where loss due to the effect of wind is minimum.

Unless specified otherwise or necessitated by site conditions, stacking of aggregate should be carried out in regular sizes.

2.2.7.3 Cement shall be transported, handled and stored at the site in such a manner as to avoid deterioration or contamination. Cement shall be stored above ground level in perfectly dry and water-tight sheds and shall be stacked not more than eight bags high. Wherever bulk storage containers are used their capacity should be sufficient to cater to the requirement at site and should be cleaned at least once every 3 months. Cement older than 3 months from the date of manufacture shall not be used. Each consignment shall be stored separately so that it may be readily identified and inspected and cement shall be used in the sequence in which it is delivered at site. Any consignment or part of a consignment of cement which had deteriorated in any way, during storage, shall not be used in the works and shall be removed from the site by the Contractor without charge to DFCCIL. For more details regarding stacking and storage of cement, refer clause 17.10.1, 17.10.2 and 26.1.2.7of Indian Railway Unified Standard Specifications (Works & Materials), Volume II, - 2010.

2.2.7.4 The reinforcement bars, when delivered on the job, shall be stored above the surface of the ground level by at least by 150mm and shall ordinarily be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Every bar shall be inspected before assembling on the works and any defective, brittle, excessively rusted or burnt bars shall be removed. Cracked ends of bars shall be cut out.

2.2.8 Testing of cement & others: -

Cement and other items shall be tested as per specifications. However, the contractor shall also arrange for additional tests at his own cost as required by the Engineer as and when required. The decision of the Engineer shall be final in this regard.

2.2.9 Concreting:

2.2.9.1 The contractor shall make his own arrangements for supply of water and electricity for all his works at his own cost. He shall arrange potable quality water for use in all concrete works and samples of water shall be got tested from approved laboratory/approved by the Engineer before being used in concreting. Apart from water, fine & coarse aggregates and all other materials shall be tested from time to time by the contractor at his cost to ensure proper quality works.

2.2.9.2 Maximum / minimum size of aggregates, standards of quality of materials, minimum cover for concrete, use of admixtures / chemicals, treatment to reinforcement / finished surfaces, etc., shall be as per relevant Codes, IS / IRS specifications and conditions of contract as specified.

2.2.9.3 All exposed concrete surfaces shall be finished smooth by the contractor at his own cost. Shuttering materials for RCC in superstructure shall be strictly of steel only to permit vigorous vibration and to ensure no deviation of finished dimensions by more than +5/-0 mm and wooden shutters are not permitted. For other works also, proper quality of shuttering materials which will permit vibrating and will not require additional finishing shall only be used. If there is any variation in the surface, alignment or lines in the products beyond permissible rejection limits indicated in these conditions, the DFCCIL reserves the right to reject the same and the contractor shall not have any claim in this regard and cost of DFCCIL materials involved will be recovered from the contractor including penalties, if any imposed.

2.2.10 Weigh batching, vibrating, curing & testing by Batching plant with computerized control:

2.2.10.1 All concrete shall be machine batched, machine mixed and machine vibrated, by using appropriate vibrators. Weigh batching plant, mixers, vibrators, etc., of appropriate capacity, as specified/directed by the Engineer, shall be arranged by the contractor at his cost. In this case, Weigh batching plants shall have computerized control for weighing, loading, mixing and delivery.

2.2.10.2 Batching plants, transit mixers, concrete pumps, etc., shall be installed by the contractor necessarily at site. In case of failure of any of the above, standby arrangements for ensuing continuous concreting has to be provided by the contractor at his cost. For piling works concreting shall be done continuously as per the volumes designed without break and accordingly standby arrangements shall be ensured by the contractor.

2.2.10.3 Curing & vibrating shall be arranged by the contractor at all locations/heights at his own cost and no extra payment on this account will be admissible. Curing of concrete shall be done as per relevant IS Codes / Specifications. If curing is not done by the contractor properly, DFCCIL may get it done through any other means at the Contractor's cost without any notice to him and recover from his bills the same including penalty if any at the discretion of the Engineer. The concrete shall be kept wet constantly by ponding or covered with a layer of sacking canvas etc.

2.2.10.4 Test cubes shall be cast at regular intervals and tested to ascertain the strength of concrete. The contractor shall establish a cube testing facility along with operator at the site or nearby area to facilitate prompt testing of concrete. Test cube moulds as required as per IS Codes shall be made available by the contractor at his cost.

2.2.11 Design Mix Concrete:

(a) **General:** Design Mix is mandatory for grades higher than M20. For concrete of compressive strength greater than M55, specialized literature should be consulted. Admixtures may be used while designing. Only design mix shall be used for all items of concrete. Prior to the start of construction, the contractor shall submit details of each trial mix of each grade of concrete to the Engineer for approval. When the proportions of the mix are approved, the contractor shall not vary any of the design parameters or the source of the materials without the approval of the Engineer. Wherever there is a significant change in materials used, fresh trial mix shall be arranged by the contractor as required by the Engineer. The concrete shall be designed keeping in view the minimum cement content and maximum cement content. Minimum cement content depends upon the environmental exposure conditions but maximum Cement Content shall be limited to 500kg/m.^{3}

(b) **Mix Design and Proportioning:** Recommended guidelines for Concrete Mix Design are given in IS: 10262 which may be referred to for details. As mentioned therein in order that not more than the specified proportion of test results is likely to fall below the characteristic strength, the concrete mix has to be designed for a somewhat higher target average compressive strength. In terms of clause 9.2.2 of IS: 456, the Target Mean Strength of Concrete mix should be equal to the characteristic strength plus 1.65 times the Standard Deviation. Mix proportion shall be designed to ensure that the workability of fresh concrete is suitable for conditions of handling and placing, so that after compaction it surrounds all reinforcement and completely fill the form work. When concrete is hardened, it shall have the stipulated strength, durability and im-permeability.

Determination of the proportions of by weight of cement, aggregate and water shall be based on design mix.

As a trial the manufacturer of concrete may prepare a preliminary mix according to provisions of SP: 23-1982. (Special Publications 23-1982 of

Bureau of Indian Standards) Mix design shall be tried and the mix proportions checked on the basis of tests conducted at a recognized laboratory approved by the Engineer. All concrete proportions for various grades of concrete shall be designed separately and mix proportions established keeping in view the workability for various structural elements, methods of placing and compacting.

(c) **Standard deviation:** Standard deviation calculations of test results based on tests conducted on the same mix design for particular grade designation shall be done in accordance with Clause 9.2.4 of IS 456. Table 8 of IS 456 gives the standard deviation that can be assumed for design of mix in the first instance. The final standard deviation figures may be determined based on test results for the particular grade of concrete when available.

Max size of Aggregate, Target Mean Strength			
Grade of Concrete	Max size of Aggregate (mm)	Characteristic Strength (f_{ck}) at 28 days (N/mm^2)	Target Mean Strength (f_{ck}) 28 days (N/mm^2)
M20	20	20	26.60
M25	20	25	31.60
M30	20	30	38.25
M35	20	35	43.25
M40	20	40	48.25
M45	20	45	53.25

(d) **Approval of Design Mix:** The contractor shall submit details of each trial mix of each grade of concrete designed for various workability conditions to the Engineer for his comments and approval. Concrete of any particular design mix and grade shall be produced / manufactured for works only on obtaining written approval of the Engineer.

2.2.12 Requirements of Consistency: - The mix shall have the consistency which will allow proper placement and consolidation in the required position. Every attempt shall be made to obtain uniform consistency. The optimum consistency for various types of structures shall be as indicated in table below or as directed by the Engineer.

Slump Required for workability		
	Type	Slump (mm)

1	(a) Structures with exposed inclined surface requiring low slump concrete to allow proper compaction	25
	(b) Plain Cement Concrete	25
2	RCC structures with widely spaced reinforcements; e.g. solid columns, piers, abutments, footings, well steining	40-50
3	RCC structures with fair degree of congestion of reinforcement; e.g. pier and abutment caps, box culverts well curb, well cap, walls with thickness greater than 300mm	50-75
4	RCC and PSC structures with highly congested reinforcements e.g. deck slab girders, box girders, walls with thickness less than 300mm	75-125
5	Underwater concreting through tremie e.g. bottom plug, cast-in-situ piling	100-200

The minimum slump of concrete in case of bored cast in situ pile shall be 150 to 200 mm.

2.2.13 Durability: - The durability of concrete depends on its resistance to deterioration & environment in which it is placed. The resistance of concrete to weathering, chemical attack, abrasion, frost and fire depends largely upon its quality and constituent materials. Susceptibility to corrosion of the steel is governed by the cover provided and the permeability of concrete. The cube crushing strength alone is not a reliable guide to the quality and durability of concrete; it must also have adequate cement content and a low water-cement ratio. The general environment to which the concrete will be exposed during its working life is classified into three levels of severity that is moderate, severe, and extreme as described below:

Environment	Exposure condition
MODERATE	Concrete surface protected against weather or aggressive conditions. Concrete surface sheltered from severe rain or freezing whilst wet. Concrete exposed to condensation.

	Concrete structure continuously under water. Concrete in contact with non-aggressive soil /ground water.
SEVERE	Concrete surface exposed to severe rain, alternate wetting & drying or occasional freezing or severe condensation. Concrete exposed to aggressive subsoil / ground water or coastal environment.
EXTREME	Concrete surface exposed to sea water spray, corrosive fumes or severe freezing conditions whilst wet. Concrete structure surfaces exposed to abrasive action, surfaces of members in tidal zone. All other exposure conditions which are adverse to exposure conditions covered above.

Maximum water-cement ratio, grade of concrete and cementitious material content for various environment conditions for achieving durability are indicated below for guidance:

2.2.13.1 Maximum Water Cement Ratio: -

The limits for maximum water cement ratio for design mix shall be based on environmental conditions as defined in durability clause. The limits for maximum water cement ratio for different environmental conditions shall be as given in Table below:

Environment	Maximum Water-Cement Ratio		
	Plain Concrete (PCC)	Reinforced Concrete (RCC)	Pre stressed Concrete (PSC)
Moderate	0.50	0.45	0.40
Severe	0.45	0.40	0.40
Extreme	0.40	0.35	0.35

2.2.13.2 Grade of Concrete: -From durability consideration, depending upon the environment to which the structure is likely to be exposed during its service life, minimum grade of concrete shall be as given in table below:

Minimum Grade of Concrete

(A) For Bridges in Pre stressed Concrete and important Bridges.

Structural member	Moderate exposure	Severe Exposure	Extreme exposure
PCC member	M-25	M-30	M-35
RCC member	M-30	M-35	M-40
PSC member	M-35	M-40	M-45

(B) For Bridges other than mentioned above and sub-structure

Structural member	Moderate exposure	Severe Exposure	Extreme exposure
PCC Member	M-15	M-20	M-25
RCC member	M-20	M-25	M-30

2.2.13.3 Cementitious Material Content*:* -Maximum Cementitious Material Content shall be limited to 500kg/m^3. Depending upon the environment to which the structure is likely to be exposed during its service life, minimum Cementitious Material Content in concrete shall be as given in table below:

Minimum Cementitious Material Content				
Environment	**Minimum Cementitious Material Content in Kg/cum**			
	Plain Concrete		Reinforced Concrete	
	(PCC)		(RCC)	
	Grade	Content	Grade	Content
Moderate	M25	240	M30	300
Severe	M30	250	M35	350
Extreme	M35	300	M40	400

2.2.13.4 Clear cover is the least distance from outer most surface of steel or binding wire or its end to the face of concrete. It is also a dimension used in design and indicated on the drawings. From durability consideration, minimum clear cover shall be as under.

Minimum Covers			
Type of structure	Extreme Environment	Severe Environment	Moderate Environment

Slab	50	35	25
Beam/Girder	60	50	35
Column	75	75	50
Piles	75	75	50

2.2.14 Permeability of concrete: Permeability requirements are as specified in IRS Concrete Bridge Code. Permeability test shall be mandatory for all RCC bridges under severe and extreme environment. Under moderate environment, permeability test shall be mandatory for all major bridges and for other bridges and structures.

2.2.15 Mixing of concrete:

2.2.15.1 Concrete shall be mixed either in a mini mobile batching plant or in a batching and mixing plant as per the specifications. Hand mixing shall not be permitted. The mixer or the plant shall be at an approved location considering the properties of the mixes and the transportation arrangements available with the Contractor. The mixer or the plant shall be approved by the Engineer.

2.2.15.2 Mixing shall be continued till materials are uniformly distributed and a uniform colour of the entire mass is obtained, and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement.

2.2.15.3 Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. The first batch of concrete from the mixer shall contain only two thirds of the normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of mix to another.

2.2.16 Transporting, Placing and Compaction of Concrete:

2.2.16.1 The method of transporting and placing concrete shall be approved by the Engineer. Concrete shall be transported and placed as near as practicable to its final position, so that no contamination, segregation or loss of its constituent materials takes place. Concrete shall not be freely dropped into place from a height exceeding 1.5 metres.

2.2.16.2 When concrete is conveyed by chute, the plant shall be of such size and design as to ensure practically continuous flow. Slope of the chute shall be so adjusted that the concrete flows without the use of excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

2.2.16.3 All formwork and reinforcement contained in it shall be cleaned and made free from standing water, dust, immediately before placing of concrete.

2.2.16.4 No concrete shall be placed in any part of the structure until approval of the Engineer has been obtained.

2.2.16.5 If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer. Concreting then shall proceed continuously over the area between the construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed.

2.2.16.6 Except where otherwise agreed to by the Engineer, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm when internal vibrators are used and not exceeding 300 mm in all other cases.

2.2.17 Concrete when deposited shall have a temperature of not less than 5^0 C and not more than 40°C. It shall be compacted in its final position within 30 minutes of its discharge from the mixer, unless carried in properly designed agitators, operating continuously. It may be necessary to add retarding admixtures to concrete if trials show that the period indicated above are unacceptable. In all such matters, engineer's decision shall be final.

2.2.18 Concrete shall be thoroughly compacted by vibration or other means approved by Engineer, during placing and worked around the reinforcement, embedded fixtures and into corners of the formwork to produce a dense homogenous void-free mass having the required surface finish. When vibrators are used, vibration shall be done continuously during the placing of each batch of concrete until the expulsion of air has practically ceased and in a manner that does not promote segregation. Over vibration shall be avoided to minimize the risk of forming a weak surface layer. When external vibrators are used, the design of formwork and disposition of vibrator shall be such as to ensure efficient compaction and to avoid surface blemishes. Vibrators shall not be applied through reinforcement and where vibrators of immersion type are used, contact with reinforcement and all inserts like ducts etc., shall be avoided. The internal vibrators shall be inserted in an orderly manner and the distance between insertions should be about one and half times the radius of the area visibly affected by vibration. Additional vibrators in serviceable condition shall be kept at site so that they can be used in the event of breakdowns.

2.2.19 Mechanical vibrators used shall be of appropriate specifications, type and capacity and as directed by the Engineer.

2.2.20 Equipment and machinery for concreting:

2.2.20.1 For concrete works, the following equipments in numbers indicated are considered necessary for efficient and speedier concreting at each site. However, the actual

numbers may be arranged as required by the Engineer, taking into account the site conditions.

Indicative List of Equipment and Machinery		
1.	Concrete Batching plant (15 to 30 cum/hr capacity)	02 No.
2.	Transit Mixers (4 to 7 cum capacity)	6 Nos.
3.	Concrete Vibrators (2 HP capacity)	8 Nos.
4.	Vibrators of Needles (60mm & 40mm)	8 Nos.
5.	Screed vibrator (for ROBs)	4 Nos.
6.	Form vibrator (500 watts capacity)	4 Nos.
7.	Generator (35 KV capacity)	4 No.
8.	Welding set (3 to 5 KV capacity)	4 No.
9.	Reinforcement Steel Cutting Machine	4 No.
10.	Reinforcement Steel Bending Machine	4 No.
11.	Concrete Pumps (10 to 20 HP capacity with 40m pipe length)	2 No.
12.	Hydra 12.0 T capacity crane	2 No.
13.	Concrete Funnel Bucket	2 No.
14.	Air compressor (100 to 150 cum capacity)	2 No.
15.	Concrete Dumpers	4 Nos.
16.	Any other including power lifts etc., as required to suit site	Adequate No.

2.2.20.2 All the machineries are required to be arranged by the contractor at his own cost and the agreement rates for concreting include the same. No extra payment is admissible for any machinery arranged by the contractor.

2.2.21 TRANSPORTATION OF CONCRETE & PUMPING OF CONCRETE

2.2.21.1 General

Fresh concrete can be transported to the placement area by a variety of methods. Common among them are:

- Mixer trucks
- Stationary truck bodies with or without agitators.
- Buckets hauled by trucks.
- Conveyor belts.
- Hose or pipe line by pumping.

Each type of transportation has specific advantages and limitations depending on the condition of use, mix, accessibility and location of placing.

2.2.21.2 Transportation by Mixer Trucks

2.2.21.2.1 These are essentially revolving drums mounted on truck chassis. Truck mixers used in the job shall be labelled permanently to indicate the manufacturer's specifications for mixing like: -

- Capacity of drum.
- Total number of drum revolutions for complete mixing.
- Mixing speed
- Maximum time limit before completion of discharge and after cement has entered the drum.
- Reduction in time period of discharge due to warm weather or other variables.

All above information shall only form guidelines for the manufacturer/producer of concrete.

2.2.21.2.2 Fulfilment of the stipulated number of revolutions or elapsed time shall not be the acceptable criterion. As long as the mixing water limit is not exceeded and the concrete has satisfactory plastic physical properties and is of satisfactory consistency and homogeneity for satisfactory placement and consolidation and is without initial set, the concrete shall be acceptable.

2.2.21.2.3 When the concrete is totally mixed in transporting trucks volume of concrete being transported shall not exceed 63% of the rated capacity of the drum. In case the concrete is totally mixed in the central batching plant, the transporting truck may be loaded up to 80% of the rated capacity of the drum. In this case the drum shall be rotated at charging speed during loading and reduced to agitating speed after loading is complete.

2.2.21.2.4 When transporting concrete by truck mixers, delivery time shall be restricted to 90 minutes or initial setting time whichever is less from the time cement has entered the mixer to completion of discharge.

2.2.21.3 Transporting by Agitating / Non-agitating Trucks.

2.2.21.3.1 Transporting ready mix concrete by this method shall consist of truck chassis mounted with open top bodies. The metal body shall be smooth and streamlined for easy discharge. Discharge may be from the rear when the body is mechanically titled. Body of the truck shall have a provision of discharge gate. Mechanical vibrators shall be installed at the discharge gate for control of discharge flow.

2.2.21.3.2 Agitators, if mounted, also aid in the discharging of concrete from the truck in addition to keeping the concrete alive.

2.2.21.3.3 Water shall not be added to concrete in transport through this system.

2.2.21.3.4 Bodies of trucks shall be provided with protective covers during period of inclement weather.

2.2.21.3.5 Delivery period, when adopting this system of transporting concrete shall be restricted to 30 minutes from the moment all ingredients including cement and water enter in mixer to completion of discharge.

2.2.21.4 Transporting by Buckets

This method of transportation is very common for transportation of centrally mixed concrete. Buckets of suitable capacities may be filled with concrete which is totally mixed in central plant and hauled to the job site. Buckets then may be conveyed to the actual point of placement either with the help of crane/hoist or they may be carted

.

As in the case of open truck transportation, extra water shall not be added to concrete transported in buckets. Concrete shall be protected from inclement weather by necessary covering arrangements. Also, maximum delivery period for this system of transportation from the time cement is introduced into the mixer to completion of discharge shall not exceed 30 minutes.

2.2.21.5 Cleaning

Before loading concrete in either truck mixer, open bodied trucks or buckets, the containers shall be thoroughly cleaned, washed and dried, so that there is no

water or moisture in the container which may affect the designed water content of the concrete.

2.2.21.6 Other Methods of Transportation

Transportation of concrete either by belt conveyors or by pumping is envisaged in some works.

If, the producer/manufacturer/purchaser/contractor of ready-mix concrete desires to use such methods of transportation, they may do so provided their scheme and complete specifications are submitted to the Engineer for his record and approval.

2.2.21.7 Objective

Method of transportation used shall ensure: -

- Efficient delivery of concrete
- No significant alteration of properties with regard to water cement ratio, slump, air content and homogeneity.
- All variables in transportation, considering type and accessibility of placement locations, distance, time interval etc., shall be carefully studied before arriving at the method used.

2.2.21.8 Pumpable Concrete (Extracted from Para 8.9 of Concrete Bridge Code, 1997)

General- Pumpable concrete is the concrete which is conveyed by pressure through either rigid pipe or flexible hose and discharged directly into the desired area. It is especially used where space for construction equipment is very limited.

Pumping Rate and Range – Depending on the equipment, pumping rate should be 10 to 70 cum. per hour. Effective pumping range is upto 300m horizontally and 90m vertically.

(i) Proportioning Pumpable Concrete

a) Basic Consideration - More emphasis on quality control is essential to the proportioning and use of a dependable pump mix. Concrete mixes for pumping must be plastic. Particular attention must be given to the mortar and to the amounts and sizes of coarse aggregates.

b) The maximum size of angular coarse aggregate is limited to one-third of smallest inside diameter of the hose or pipe. Provisions should be made for elimination of oversized particles in the concrete by finish screening or by careful selection of aggregates.

(ii) Pumping Concrete

a) Proper planning of concrete supply, pump locations, line layout, placing sequences and the entire pumping operation will result in saving of cost and time. The pump should be placed as near the placing area as practicable and the entire surrounding area must have adequate bearing strength. Lines from the pump to the placing area should be laid out with a minimum of bends. The pipe line shall be rigidly supported.

b) While pumping downward 15m or more, it is desirable to provide an air release valve at the middle of the top bend to prevent vacuum or air build up. When pumping upward, it is desirable to have a valve near the pump to prevent reverse flow.

2.2.22 Construction Joints: -

2.2.22.1 Construction joints shall be avoided as far as possible and in no case the locations of such joints shall be changed or increased from those shown on the drawings, except with express approval of the Engineer. The joints shall be provided in a direction perpendicular to the member axis. Sequencing of concrete placement should be organized in such a way that cold joints are totally eliminated. The sequence of concreting shall be submitted for approval of Engineer prior to concreting of the structural element. Concreting shall be carried out continuously up to the construction joints, the position and arrangement of which shall be predetermined by the designer.

2.2.22.2 Construction joints should be positioned to minimize the effect of the discontinuity on the durability, structural integrity and appearance of the structure. Joints should be located away from regions of maximum stress caused by loading particularly where shear and bond stresses are high.

2.2.22.3 Laitance, both on the horizontal and vertical surfaces of the concrete, should be removed before fresh concrete is cast. The surface should be roughened to promote good adhesion. Various methods for removal can be used but they should not dislodge the course aggregate particles. Concrete may be brushed with a stiff brush soon after casting while the concrete is still fresh and while it has only slightly stiffened. If the concrete has partially hardened, it may be treated by wire brushing or with a high pressure water jet, followed by drying with an air jet, immediately before the new concrete is placed. Fully hardened concrete should be treated with mechanical hand tools or grit blasting, taking care not to split or crack aggregate particles.

2.2.22.4 Where there is likely to be a delay before placing the next concrete lift, protruding reinforcement should be protected. Before the next lift is placed, rust loose mortar, or other contamination should be removed from the bars and where conditions are

particularly aggressive and there has been a substantial delay between lifts, the concrete should be cut back to expose the bars for a length of about 50 mm to ensure that contaminated concrete is removed.

2.2.22.5 In all cases, when construction joints are made, it should be ensured that the joint surface is not contaminated with release agents, dust, or curing membrane and that the reinforcement is fixed firmly in position at the correct cover.

2.2.22.6 When the formwork is fixed for the next lift, it should be inspected to ensure that no leakage can occur from the fresh concrete. It is a good practice to fix a 6 mm thick sponge which seals the gap completely. The practice of first placing a layer of mortar or grout is not recommended. The old surface should be soaked with water without leaving puddles, immediately before starting concreting; then the new concrete should be thoroughly compacted against it. When fresh concrete is cast against existing mature concrete or masonry the older surfaces should be thoroughly cleaned and soaked to prevent the absorption of water from the new concrete. Standing water should be removed shortly before the new concrete is placed and the new concrete should be thoroughly vibrated in the region of the joint.

2.2.23 **Finishing of concrete:** The finished surface of concrete after removal of formwork shall be such that no touching up is required. All fins/holes caused by form joints, supports, rods etc., shall be ground/filled up effectively using appropriate machinery shutters, formwork etc., used in construction shall be as specified in the conditions and the labour used shall be skilled to suit the quality requirements of the work. Any surface, finished poorly in the opinion of the Engineer shall require repair/remedial measures at the cost of the contractor and the Engineer's decision in this regard shall be final. Any structure, which has deficiencies in finishing including product parameters beyond the rejection limits, as specified in these conditions, are liable to be rejected and the decision of the Engineer shall be final in this regard.

2.2.24 **Coatings for concrete:** Normally finished concrete structures do not require any surface protective coatings in non-aggressive environment (moderate) for all structures. For aggressive environment (severe and extreme conditions), Epoxy phenolic IPN coating or CECRI Integrated four coat system can be used in superstructure of bridges and coal tar epoxy coating for sub structure of bridges (in affected part only).

2.2.25 Shuttering, Formwork & False work: -

2.2.25.1 Shuttering, Formwork & False work shall be designed to meet the requirements of the permanent structure, taking into account the actual conditions of materials, environment and site conditions. Careful attention shall be paid to the detailing of connections and functions. All the materials used for shuttering, formwork & false work shall conform to the specified quality consistent with the intended purpose and actual site condition as applicable. All shuttering, form work, false work, etc., shall be got approved by the Engineer before it is put into use.

2.2.25.2 Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subjected at the time of removal of formwork or as approved by the Engineer. In normal circumstances and where Ordinary Portland Cement is used, forms may generally be removed after the expiry of the following periods: -

Stripping Time	
a) Walls, columns and vertical faces of all structural members	24 to 48 hours as may be decided by the Engineer
b) Slabs (props left under)	3 days
c) Beam soffits (props left under)	7 days
d) Removal of props under slabs 1) Spanning up to 4.5 m 2) Spanning over 4.5 m	 7 days 14 days
e) Removal of props under beams 1) Spanning up to 6 m 2) Spanning over 6 m	 14 days 21 days

Where the shape of the element is such that the formwork has re-entrant angles, the formwork shall be removed as soon as possible after the concrete has set, to avoid shrinkage crack occurring due to the restraint imposed.

2.2.26 Defective Concrete and Measurement of concrete:

2.2.26.1 Should any concrete be found honeycombed or in any way defective which may be, at the discretion of the Engineer suspected to affect the performance of the structure, shall be rejected outright. Contractor shall have no claim in this regard and the decision of the Engineer shall be final. The member, structurally independent, in which the concrete is found to be defective, shall be replaced by the contractor at his cost fully. The damages arising on account of such defective concreting shall also be recoverable from the dues of the contractor, including penalties if any. DFCCIL reserves the right to get the member replaced by any means at the cost of the contractor at any cost if the contractor delays reproduction.

2.2.26.2 However, some surface defects, not affecting the structural properties shall, on the instruction of the Engineer, be repaired as per the approved procedures. The complete cost of such repairs shall be borne by the contractor and no compensation shall be payable. Records of such repairs done shall be maintained by the contractor.

Tolerances for Finished Concrete Bridge Structure		
S No	Description of defects in any part or full member or the structure at the decision of the Engineer.	Permissible limits (unless otherwise specified in designs/drawings)
1	Shift from alignment	± 25 mm in member.
2	Deviation from plumb in piers or variation from specified batter.	1 in 250 subjected to a maximum value of 0.5 times the least lateral dimension of pier.
3	Deviation from plumb in abutments or variation from specified batter.	1 in 125
4	Cross sectional dimensions of piers, abutments and girders	+20mm/-5mm
5	Thickness of deck slab of bridges	+ 6 mm / - 3 mm
6	Size and location of openings	± 12 mm
7	Plan dimensions of footings (formed excavation)	+ 50 mm / - 25 mm
8	Plan dimensions of footings (unformed excavation)	+ 75 mm / - 00 mm
9	Thickness of footings	– 5%, + No limit
10	Footing eccentricity	0.02 times the width of the footing in the direction of deviation, but not more than 50 mm
11	Reduced level of top of footing / pier / bed block	± 5 mm
12	Centre to centre distance of pier and abutments at pier top	± 30 mm
13	Centre to centre distance of bearings along span	± 5 mm
14	Centre to centre distance of pier bearings across span	± 5 mm

2.2.26.3 The tolerances for finished concrete bridge structures shall be governed by IRS Concrete Bridge Code and shall be followed; deviations beyond the permissible limits shown are liable to be rejected. These tolerances apply to other structures also appropriately.

2.2.27 Sampling and Strength Testing of Concrete:

2.2.27.1 General: Samples from fresh concrete shall be taken as per IS: 1199 (method of sampling and analysis of concrete). Concrete for making 3 test cubes shall be taken from a batch of concrete at point of delivery into construction according to procedure laid down in IS: 1199 and 150 mm cubes shall be made, cured and tested at the age of 28 days for compressive strength in accordance with IS:516. The 28 days' test strength result for each cube shall form an item of sample.

Concrete shall conform to the surface finish and tolerance as prescribed in Unified specifications. Random sampling and lot by lot of acceptance / inspection shall be made for the 28 days cube strength of concrete.

Concrete under acceptance shall be notionally divided into lots for the purpose of sampling, before commencement of work. The delimitation of lots shall be determined by the following:

(i) No individual lot shall be more than 30 cum in volume.

(ii) At least one cube forming an item of the sample representing the lot shall be taken from concrete of the same grade and mix proportions cast on any day.

(iii) Different grades of mixes of concrete shall be divided into separate lots.

(iv) Concrete of a lot shall be used in the same identifiable component of the bridge.

2.2.27.2 Sampling

2.2.27.2.1 Frequency of Sampling

Sampling procedure: A random sampling procedure shall be adopted to ensure that each concrete batches forming the lot under acceptance / inspection shall have a reasonable chance of being tested that is, sampling should be spread over the entire period of concreting and cover all mixing units.

Frequency: The minimum frequency of sampling of concrete of each grade shall be in accordance with table below. At least one sample shall be taken from each shift of work.

Minimum Frequency of Sample	
Quantity of concrete in work, (m^3)	No. 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 50 M^3 or part thereof

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

2.2.28 Test Results of Sample: The test results of the sample shall be the average of the strength of 3 specimens. The individual variation should not be more than $\pm$ 15 percent of average. If more, test results of the sample are invalid.

2.2.29 Acceptance Criteria of Concrete: Acceptance criteria shall be acceptance of concrete as per Clause No 16 of Annexure 4.2 of Indian Railway Unified Standard Specifications (Works & Materials), Volume I, 2010.Also refer criteria of concrete vide clause no 20.3.11.5 of Indian Railway Unified specifications. The 28 days compressive strength shall be the criterion for acceptance or rejection of the concrete.

The followings shall also be strictly followed.

(i) Whenever a mix is redesigned due to a change in the quality of aggregate or cement or for any other reason, it shall be considered a new mix and initially subject to the acceptability criteria above.

(ii) If the concrete produced at site does not satisfy the above strength requirements, the Engineer shall reserve the right to require the contractor to improve the methods of batching, the quality of the ingredients and redesign the mix with increased cement content, if necessary. The Contractor shall not be entitled to claim any extra cost for the extra cement used for the modifications stipulated by the Engineer for fulfilling the strength requirement specified.

(iii) It is the complete responsibility of the contractor to redesign the concrete mixes by approved standard methods and to produce the reinforced concrete conforming to the specification and the strength requirements approved by the

Engineer. It is expected that the Contractor will have competent staff to carry out this work.

2.2.30 Setting of field laboratory by the Contractor:

2.2.30.1 For all works, the Contractor shall set up a field laboratory of his own for testing of cement/water/concrete at work site, which should be open for use and inspection by the DFCCIL officials at any time and carryout the tests with his own equipments, gauges, machinery, consumables and operators, at his own cost. The laboratory shall be equipped with necessary equipment to carry out various tests such as property tests, sieve analysis, setting time of cement, compression tests on cubes, slump test, workability test etc., on aggregate, cement, water and concrete required for ensuring the required quality. For steel however, test reports of reputed institutes/laboratories are acceptable.

2.2.30.2 The cost of setting up the laboratory, equipping the same, maintaining conducting all tests on materials and cubes shall be borne by the contractor, within his quoted rates for works and no extra payment is eligible for the same.

2.2.30.3 All gauges, machines, equipments and other measuring and testing equipments of the laboratory shall be got checked / calibrated regularly and the necessary certificates furnished to the Engineer by the Contractor.

2.2.30.4 All the equipments, machinery etc., shall be kept in good working condition. Contractor shall also maintain the required qualified / experienced staff at the laboratory.

2.2.30.5 The following is the minimum laboratory facilities at the site which are to be provided and operated by the contractor at his cost.

(i) Testing of fine and coarse aggregates as per IS:383 and IS:2386.

(ii) Testing of cement concrete as per IS: 8142 and IS:516.

(iii) Testing of water as per IS: 456 and IS: 3025.

(iv) Certain non-routine testing such as (a) Testing of admixtures, (b) Chemical testing of fine and coarse aggregates (c) Permeability of concrete (permeability test on concrete shall be got done when the mix design is approved / changed of the reputed laboratories as approved by Engineer). The frequency and need for these tests shall be decided by the Engineer, based on stipulations contained in conditions of contract or on the basis of accepted Engineering practice (e.g. whenever source of admixture is changed, tests stipulated in the codes will have to be carried out afresh, etc).

2.2.30.6 As frequently as the Engineer may require, testing shall be carried out in the field for:

(a) Moisture content and absorption and density of sand and aggregate.

(b) Silt content of sand.

(c) Grading of sand and aggregates.

(d) Slump test of concrete.

(e) Concrete cube test.

(f) Permeability test for concrete

(g) Density of Plasticizer.

(h) PH Value of water

2.2.31 Ladders for inspections: Steel ladders are to be provided at the abutments and all pier locations on both sides of girder bridges to enable inspecting officials to get down from the track level to the top of the piers / abutments.

2.2.32 Expansion joints: Expansion joints – strip seal elastomeric type expansion joint shall be for 80mm expansion gap in RCC deck slab as per drawings.

2.2.33 Seating of foundations:

As far as possible, open foundations should be located on the firm ground having stable strata. The strata shall be well compacted before levelling course and foundations are laid on the levelling.

In case foundations resting on rock, no foundation shall be laid on sloping rock. The rock shall be made level for the width of the foundation before levelling course is laid. Before seating on the rock, capacity of the rock shall be assessed properly and safe bearing capacity assessed in the designs is to be confirmed.

The seating of the rock shall be achieved by cutting into the rock atleast by 0.50m depth to ensure removal of all weak layers and for obtaining adequate anchorage in case of open foundations. After level surface is made on the rock, a rich mix layer of 150mm thick shall be laid to even the bedding surface.

If the rock is encountered while piling, pile shall be anchored into rock to the depth as per codal provision.

2.2.34 Drainage outlets: 50mm galvanized GI pipes in case of deck slab in bridges will serve as drainage spouts.

2.3 GENERAL GUIDELINES AND SPECIFICATIONS FOR BORED CAST-IN-SITU RCC PILE FOUNDATIONS:

2.3.1 The piles shall be bored cast-in-situ. The scope of the work included in relevant schedules is for the provision and testing of bored cast-in-situ RCC pile foundations with the pile cap. Items for piling in soil has been provided in schedule. If any boulder in the form of obstruction comes in the boring, no extra payment for piling in boulders shall be made. Bore log provided by the DFCCIL for construction are only indicative in this regard and it is the contractors' responsibility to make correct assessment of ground conditions before starting the piling operation. Rate of Item of piling includes cost of all materials and labour involved in all operations as specified excluding supply of cement and steel reinforcement only.

2.3.2 **CONCRETING IN BORED CAST-IN-SITU PILES**

(i) Bored Cast-in-situ concrete piles shall be installed by making a bore into the ground by removal of material. Cast-in-situ concrete piles may be cast in metal liners which may remain permanently in place. The metal casing shall be of sufficient thickness and strength to hold its original form and show no harmful distortion after it and adjacent casings have been driven and the driving core, if any, has been withdrawn.

(ii) Concreting and reinforcement work will be done in accordance with relevant clauses in Chapters 3 and 4 of Indian Railway Unified Standard Specifications (Works & Materials) Volume - I, 2010 supplemented by these specifications.

(iii) Any liner or bore-hole which is improperly located or shows partial collapse that would affect the load carrying capacity of the pile, shall be rejected or repaired as directed by the Engineer at the cost of the Contractor.

(v) Bored cast-in-situ piles in soils which are stable may often be installed with only a small casing length at the top. A minimum of 2.0m length of top of bore shall invariably be provided with casing to prevent any loose soil falling into the bore. In cases in which the side soil lower down can fall into the hole, it is necessary to stabilise the side of the bore hole with drilling mud, or a suitable steel casing. The casing may be left in position permanently specially in cases where the aggressive action of the ground water is to be avoided, or in the cases of piles built in water or in cases where significant length of piles could be exposed due to scour.

(vi) For bored cast-in-situ piles, casing / liner shall be driven open ended with a pile driving hammer capable of achieving penetration of the liner to the length as approved by the Engineer. Materials inside the casing shall be removed progressively by air lift, grab or percussion equipment or other approved means. Unless otherwise approved by the Engineer, the diameter of the bore-holes shall be not more than the inside diameter of the liner.

(vii) Where bored cast-in-situ piles are used in soils liable to flow, the bottom of the casing shall be kept enough in advance of the boring tool to prevent the entry of soil into the casing, thus preventing the formation of cavities and settlements in the adjoining ground. The water level in the casing should generally be maintained at the natural ground water level for the same reasons. The joints of the casing shall be made as tight as possible to minimise inflow of water or leakage of slurry during concreting. Where mud flow conditions exist, the casing of cast-in-situ piles shall not be allowed to be withdrawn. Prior to the lowering of the reinforcement cage into the pile shaft, the shaft shall be cleaned of all loose materials. Cover to reinforcing steel shall be maintained by suitable spacers, tied in advance to the reinforcement.

(viii) Wherever practicable, concrete should be placed in a clean dry hole. Where concrete is placed in dry condition and there is casing present, the top 3m of the pile shall be compacted using internal vibrators.

(ix) Before concreting under water, the bottom of the hole shall be cleaned of drilling mud and all soft or loose material very carefully. In case a hole is bored with use of drilling mud, concreting should not be taken up when the specific gravity of bottom slurry is more than 1.2. The drilling mud should be maintained at 1.5m above the ground water level.

(x) Where the casing is withdrawn from cohesive soils for the formation of cast-in-situ pile, the concreting should be done with necessary precautions to minimise the softening of the soil by excess water. Care shall be taken during concreting to prevent as far as possible the segregation of the ingredients. The displacement or distortion of reinforcement during concreting and also while extracting the tube shall be avoided.

(xi) The concrete shall be properly graded, shall be self-compacting and shall not get mixed with soil, excess water, or other extraneous matter. Special care shall be taken in silty, clays and other soils with the tendency to squeeze into the newly deposited concrete and cause necking. Sufficient head of green concrete shall be maintained to prevent inflow of soil or water into the concrete.

(xii) The placing of concrete shall be a continuous process from the toe level to the top of the pile. To prevent segregation, a tube or tremie pipe as appropriate shall be used to place concrete in all piles.

(xiii) To ensure compaction by hydraulic static heads, rate of placing concrete in the pile shaft shall not be less than 6m (length of pile) per hour. Under water concreting should be done with tremie.

(xiv) The maximum water cement ratio shall be 0.50 for cast in situ piles.

(xv) The cement content shall not be less than 400 kg/cum of concrete.

(xvi) The minimum slump of concrete for bored cast-in-situ piles shall 150mm to 200mm, but the slump should not exceed 200mm in any case.

(xvii) **Concreting under water: -**General requirements and precautions for concreting under water shall be as given in concreting chapter 3 of IR Unified Standard Specifications (Work & Materials), Volume - I, 2010 supplemented by following instructions:

(a) The concreting of a pile must be completed in one continuous operation. Also, for bored holes, the finishing of the bore, cleaning of the bore, lowering of reinforcement cage and concreting of pile for full height must be accomplished in one continuous operation without any stoppage.

(b) The concrete should be coherent, rich in cement with high slump and restricted water cement ratio.

(c) The tremie pipe will have to be large enough with due regard to the size of aggregate. For 20mm aggregate the tremie pipe should be of diameter not less than 150mm and for larger aggregate, larger diameter tremie pipes may be necessary.

(d) The first charge of concrete should be placed with a sliding plug pushed down the tube ahead of it to prevent mixing of water and concrete.

(e) The tremie pipe should always penetrate well into the concrete with an adequate margin of safety against accidental withdrawal if the pipe is surged to discharge the concrete.

(f) The pile should be concreted wholly by tremie and the method of deposition should not be changed part way up the pile to prevent the laitance from being entrapped within the pile.

(g) All tremie tubes should be scrupulously cleaned after use.

(h) In special circumstances, the Engineer may permit use of any other proved method of concrete placement designed for under water concrete. In such cases, a detailed method statement should be prepared and got approved by the Engineer.

(xviii) The diameter of the finished pile shall not be less than that specified and a continuous record shall be kept by the Engineer as to the volume of concrete placed in relation to the pile length cast.

2.3.3 The schedule of quantities in this contract is based on bored cast-in-situ pile of required capacity and for approximate anticipated depth as indicated in the drawings. Depth of piles is likely to vary and contractor shall have no claim whatsoever irrespective of the depth of piles provided at any and all locations. Installation of piles shall be carried out as per layout drawings, installation criteria and the instructions of the Engineer. The method of installing the piles, including details of the equipment shall be submitted by the contractor and got approved by the Engineer before start of work.

2.3.4 Piling work shall conform to specifications IS: 2911 Parts 1 & 4 unless otherwise specified.

2.3.5 Workmanship of bored cast-in-situ piles includes the provisions for control of piling installation, use of drilling mud, cleaning of borehole, tremie concreting, defective pile, recording of data shall be as per Clause 8 of IS: 2911(Part 1/Section 2).

2.3.6 The specifications for safe load, test load, total displacement, net displacement etc., shall also conform to provisions as per IS: 2911 (Part 4).

2.3.7 The contractor shall set out piles with precision survey duly erecting permanent bench marks and other references. He shall be responsible for correct maintenance of position and plumb thereafter and these shall be checked periodically. The control of alignment and inclination of piles shall be as per IS:2911 (Part 1/Section 2). Tolerances as specified in the above code or as specified shall govern.

2.3.8 Level marks shall be put accurately on each pile immediately after it is installed. If any pile shows subsequently a tendency to heave up due to installation of other piles later or due to any other reason, corrective course of action shall be suggested and taken by the contractor after approval by the Engineer at the cost of contractor.

2.3.9 Durability provisions such as clear cover to reinforcements, minimum and maximum cement content, maximum water-cement ratio and permeability of concrete shall be adhered to as mentioned earlier and below. The exposed area of pile above the ground level. In case of harmful chemical constituents found in subsoil and in water such as chlorides and sulphides, special provisions as per relevant codes of practice shall be followed for protection against reinforcement corrosion and disintegration of concrete and for such protection against corrosion and bio-fouling, the pile concrete/liner below cut-off level shall be painted with appropriate material, if ordered by Engineer for which payment will be made separately as specified in relevant schedules.

2.3.10 Sulphate resistant cement may be used on need-based consideration after conducting the soil investigation and water investigation. It shall not be used under such conditions where concrete is exposed to risk of excessive chlorides and sulphate attack both. Requirements of concrete exposed to sulphate attack shall be as per Table 4 of IS:456. Where chloride is encountered along with sulphate in soil

or ground water, Ordinary Portland Cement with C3A contents from 5 to 8 % shall be desirable to be used in concrete instead of sulphate resisting cement. For pH around 4, steel and concrete both have to be specially quoted. If sulphate resistant cement is used which has faster setting properties, curing shall start within five hours of concreting.

2.3.11 Method of boring, namely, Bailer and Chisel, Rotary, Direct Mud Circulation (DMC), Reverse Mud Circulation (RMC), Percussion, etc., shall be chosen as appropriate to strata and site conditions. The agreement rates for piling are inclusive of any type of boring/any type of supporting arrangements adopted by the contractor and no extra payments are admissible for any type of scheme adopted by the contractor.

2.3.12 Borehole stability shall be maintained with casing and/or mud circulation.

2.3.13 Use of drilling mud (Bentonite) in stabilizing the sides of bore holes is mandatory in soils of inadequate capacity. The decision on the need of use of Bentonite will be taken by the Engineer which is final. The bentonite slurry shall be maintained at 1.5m above the ground water level during boring operations and till the pile is concreted. The bentonite slurry shall be under constant circulation till start of concreting and shall meet the requirements stipulated in the subsequent clauses. Agreemental rates for piling includes the cost of Bentonite and related operations and the contractor cannot claim any extra cost on this account.

2.3.14 Providing MS Liners: This item is for supply and fixing contractor's permanent MS liners for the pile from the top of working platform upto the required depth as may be decided by the Engineer. The contractor shall fabricate the MS liners from his own MS sheets to suit the diameter of the pile as directed. Required length of MS liners will be made up by welding each unit outside by the contractor with his own equipments and plants. It shall be clearly noted that the MS sheets required for manufacture of the liners shall not be supplied by the DFCCIL. The welding shall be of proper quality so as to withstand the hammering forces. The payable depth shall however, be measured only from the cut off level though the liner might have been provided right from the level of working platform on practical considerations, since the length above the cut off level has to be necessarily removed by gas cutting for facilitating peeling of the top portion of the pile and for interlacing its reinforcement bars into the capping slab. Therefore, the rate quoted shall cater for the element of cutting and removing the surplus length of MS liners. There is, however, no objection for the surplus pieces, if usable, are united and are re-welded to the required length for reuse on some of the other piles. No claim shall be entertained if the cut pieces cannot be reused by the contractor.

2.3.15 The contractor shall take all necessary precautions while piling close to existing structures/other foundations/track so as to minimize vibrations and ground movement. Bores shall be encased as directed by the Engineer and boring shall commence only after precautionary measures are taken. While working near the

existing track, infringements and other safety aspects shall be specially considered and taken care of.

2.3.16 The contractor shall indemnify the DFCCIL Administration against any claim or obligations arising out of any damage to structure or out of any injury to any person/persons due to piling working done by him.

2.3.17 The contractor shall mobilize and maintain requisite resources for piling including concreting. Additional resources, as a standby shall also be available in advance of work, to take care of any eventualities. Admixtures as approved by Engineer, shall be kept in readiness before concreting to meet any exigencies. After boring and/or cage lowering to avoid borehole instability and settlement of bentonite, boreholes shall not be left un-concreted for long.

2.3.18 The spoils arising out of boring shall be disposed off as directed by Engineer within the agreemental rates. In case of piling close to Railway track or near the existing road, contractor shall make adequate arrangements for disposing the muck away properly. Contractor shall also make adequate drainage arrangement for mud slurry so that the same does not affect the tracks or roads or adjoining properties.

2.3.19 The bored spoils may be dumped in a low lying area as directed by Engineer so that work site is restored back to normal condition after completion of work.

2.3.20 When the bore has reached its final depth, it shall be free from any foreign matter before placing the reinforcement cage and concreting for the pile is started. Reinforcement for the pile shall be carefully placed in position and concreting then started. The cover block used also shall satisfy strength and permeability criteria.

2.3.21 If hard rock is encountered, socketing in hard rock shall also be provided as per codal provision.

2.3.22 In case of sloping bedrock profile, the requisite depth of socketing shall be ensured as minimum all round piling and the payment will be made for the least depth of socketing only and no claims of differential depth of socketing are admissible.

2.3.23 The bottom level of pile cap will be decided by Engineer, depending upon capacity and ground level.

2.3.24 Care shall be taken for free flow of concrete through splices and congested reinforcement zones with proper detailing and monitoring.

2.3.25 The quantity of concrete required for a particular pile shall be calculated as per depth of the pile and nominal diameter of the pile. This quantity shall be checked with the actual quantity of concrete used, which is to be recorded and signed jointly by the contractor and representative of the DFCCIL. Theoretical quantity of concrete, calculated as per depth and nominal diameter of the pile shall form the

basis of calculating the cement quantity as per approved design mix, for payment to the contractor,

2.3.26 For the finishing of pile heads, the clearances of reinforcements in the pile cap and the keying of the pile head into the pile cap shall be as given in IS: 2911.

2.3.27 The contractor shall maintain bore log register and bored samples for each pile boring and concreting. The details shall contain various operations in pile boring with time, type of soil met with depth of penetration with levels, liner welding and lowering details, obstruction to boring, if any, machine down time, rock touch level and final socketed level. The flushing out details before cage lowering and before concreting shall also be recorded. The concreting details such as mix proportions, sounding at various depths vis-à-vis cement / concrete consumption, unusual observations while concreting, interruption to concreting, if any and overflow concrete shall be recorded. The swelling and/or squeezing of borehole in uncased portion shall be specially monitored with recording of sounding depth, quantity concreted actually and quantity theoretically estimated corresponding to that sounding depth.

2.3.28 The payable depth of piles shall be taken up to the clear distance from the cut-off level (bottom of pile cap) to the average bottom of the bore. The depth so measured shall be rounded off to the nearest first decimal of a metre (0.05 metre or more to be reckoned as 0.10 metre whereas below 0.05 metre to be reckoned as 0.00 metre) for the purpose of making payment.

2.3.29 In group of two or more piles, piles of same diameter and same load carrying capacity shall be installed. The distance between centre to centre of such piles shall be governed by IS :2911. In case the contractor offers to install the piles closer than this spacing, he shall state the reduction in the working load of the pile which will be subject to the approval of Engineer. The additional piles required on this account shall be provided by the contractor without any extra cost to the DFCCIL. Also cost of cement and steel reinforcement used on this score will have to be borne by the contractor. New MS liners shall also be to contractors account.

2.3.30 If any pile during boring has deviated from the design position or from the verticality or if the safe allowable load of the pile is not obtainable as per the design, all these facts shall be reported promptly to the Engineer during the execution of the work with suggestion from the contractor regarding adequate corrective measures. The Engineer shall consider the suggestions of the contractor and shall give necessary directions for the corrective measure which shall be done by the contractor at his own cost and risk. However, if certain piles are rejected by the Engineer on account of improper location / verticality / alignment / capacity, the Engineer may allow the rejected piles to be left in their places and additional piles may be installed to take up the safe working load of the rejected piles with satisfaction of Engineer without any extra cost to the DFCCIL. If any such changes involve additional expenditure due to increase in size of pile cap etc., the same shall also be borne by the

contractor including the extra cost involved in the usage of the extra quantity of cement and steel used in such changes.

2.3.31 No payment will be made for rejected piles and also for the cement, steel and the MS liners provided for the rejected piles.

2.3.32 **Pile load Test:** IS: 2911 (Part 4) prescribes various guidelines and procedures for load tests on piles. Pile load test shall be conducted as per IS: 2911 (Part 4) and as directed by the Engineer. Vertical load tests (compression) and lateral load tests shall be adopted for testing of piles. There shall be two categories of tests on piles for each type of loading (vertical and lateral), namely, initial tests and routine tests. Initial tests should be carried out on test piles which are not to be incorporated in the work. Routine tests shall be carried out as a check on working piles.

Initial load test is carried out to determine the ultimate load capacity and arrival at the safe load by application of factor of safety whereas routine test is conducted to determine the safe load of pile, checking the safety load and extent of safety. In other words, routine test is conducted to check whether the pile is capable of taking the working load assigned to it.

Non-destructive testing i.e. Integrity testing of pile using Low Strain / Sonic Integrity Test / Sonic Echo test method in accordance with IS: 14893 shall be carried out for integrity testing of concrete in the installed pile.

The vertical load test and lateral load test shall be carried out as per clause 6 and 7 of IS: 2911 (Part 4).

Safe load on a pile is derived by applying a factor of safety on ultimate load capacity of pile as determined by a load test whereas working load is the load assigned to pile according to design. The safe loads on single pile and on group of piles for the initial test and routine test shall be in accordance clause 6.1.5 and 6.1.6 of IS: 2911(Part 4). Test load shall be 2.5 times the safe capacity load for Initial Load. For routine test, test load shall be at least 1.5 times the working load for maximum settlement not exceeding 12mm in case of single pile whereas test load shall be equal to the working load for maximum settlement not exceeding 25mm in case of group piles.

The test shall be carried out at cut off level wherever practicable, otherwise suitable allowance shall be made in the interpretation of the test results / test load if the test is not carried out at cut-off level.

The contractor shall submit all data along with load vs settlement, time vs settlement, interpretation of the pile load test, etc., in a report along with characteristics of the pile as per IS 2911 and as directed by the Engineer.

For any other type of test such as pull-out tests, etc. if considered necessary, the contractor shall make arrangements in consultation with the Engineer and payments for the same will be eligible as decided mutually in advance.

Payment for initial vertical load test, routine vertical load test and lateral load test will be made against a separate item provided in the schedule.

2.3.33 The contractor is required to carry out load test in pile or group of piles as per provisions contained in IS: 2911 (Part 4) of and shall provide all the designing, testing, loading, supporting, instrumenting, recording & reporting arrangements at the agreement rates. The design, instrumentation etc., shall be approved by the CGM / GM/ROB, /CPM, DFCCIL.

2.3.34 The payment for the test of the pile or group of piles shall be made to the contractor only when the test is found to be satisfactory. For tests which are found to be unsatisfactory or which are not completed due to any reasons whatsoever, no payment shall be made to the contractor.

2.3.35 The agreemental rates for tests include instrumentation, reporting, arranging of necessary kentledge, R.S. Joists, sand bags, etc., required for loading the platform for successful testing of the pile or group of piles and removing the same from the site of work after the test is completed and clearing the site to the satisfaction of the Engineer and no extra payment shall be made on this account.

2.3.36 In case of defective piles, DFCCIL reserves the right to order, at the cost of contractor, non-destructive test for integrity and / or capacity assessment or additional static load tests as confirmatory tests at the cost of the contractor. The test shall be considered satisfactory only if the criteria laid in specifications are satisfied and the behaviour of the pile or pile group during the period of test does not disclose any defects as specified in relevant codes and as directed by the Engineer.

2.3.37 Each pile shall be identified with a reference member. Level marks shall be accurately painted on each pile immediately after its installation. The contractor shall record all the information during installation of piles as directed by the Engineer. Pile records in triplicate shall be submitted by the contractor.

2.3.38 Approval of the termination depth of the pile by the Engineer shall, in no way, absolve the contractor on the integrity of the pile.

2.3.39 **Control of Position and Alignment:** Piles shall be installed as accurately vertical (for vertical piles) as possible. The permissible limits for deviation with respect to position and alignment shall confirm to IS: 2911 (Part 1/Section 2).

2.3.40 working level shall be above the cut-off-level. After the initial boring of about 1m, temporary guide casing of suitable length shall be lowered in the pile bore for

vertical pile. The diameter of guide casing shall be such as to give the necessary finished diameter of the concrete pile. The centre line of guide casing shall be checked before continuing further boring. Guide casing shall be minimum of 1.0m length. Additional length of casing may be used depending on the condition of the strata, ground water level etc. The temporary guide casing (if provided) shall be withdrawn cautiously, after concreting is done upto the required level. While withdrawing the casing, concrete shall not be disturbed.

2.3.41 Permanent MS Liners shall be provided for piles upto point of refusal or as directed by the Engineer. The bottom end of the MS Liner shall be stiffened by welding additional plates to withstand the impact during driving.

2.3.42 In case hard rock is encountered, chiselling is essentially required for softening of the rock, the same may be adopted only on approval of the Engineer, at no extra cost to the DFCCIL. Advancement of pile bore shall be done by drilling only, in case of use of rotary hydraulic drilling rig.

2.3.43 Specifications for Bentonite shall be as follows: Liquid limit of bentonite when tested in accordance with IS: 2720 (Part V) shall be 400 percent or more. Bentonite solution should be made by mixing it with fresh water using pump for circulation. The density of the freshly prepared bentonite suspension shall be between 1.03 and 1.10 gm / ml depending upon the pile dimensions and type of soil in which the pile is to be installed. However, the density of bentonite suspension after mixing with deleterious materials in the pile bore may be upto 1.25 gm / ml. The marsh viscosity when tested by a marsh cone shall be between 30 to 60stoke. The pH value of the bentonite suspension shall be between 9 and 11.5.

2.3.44 Cleaning of borehole: - After completion of borehole upto the required depth, the borehole shall be cleaned as per clause 8.3 of IS: 2911 (Part 1/Section 2).

2.3.45 A protocol shall be maintained regarding the strata at the founding level, SPT value, percent core recovery, Unconfined Compressive Strength (UCS) from the nearest borehole, socketing horizon, flushing of pile bore, time interval between end of boring and start of concreting, bentonite density before start of concreting.

2.3.46 Top of Concrete in Pile and Cut off-level (COL): - Cut-Off-Level of piles shall be as indicated in drawings released for construction. The top of concrete in pile as cast shall be above the cut-off-level by 1.0 metre (maximum) to remove all laitance and weak concrete and to ensure good concrete at cut-off-level, for proper embedment into the pile cap. The area surrounding the piles shall be excavated up to the bottom of the pile caps. After seven days of concreting of pile, the exposed part of concrete above the COL shall be removed / chipped off and made rough at COL. The projected reinforcement above COL shall be properly cleaned and bent to the required shape and level to be anchored into the pile cap. The pile top shall be embedded into the pile cap by 150 mm or clear cover to reinforcement, whichever

is higher. All loose material on the top of pile head after chipping to the desired level shall be removed and disposed off as directed by the Engineer.

2.3.47 Reinforcement: The longitudinal reinforcement shall project 50 times its diameter above cut-off-level unless otherwise indicated. Proper cover to reinforcement and central placement of the reinforcement cage in the pile bore shall be ensured by use of suitable concrete spacers or rollers, cast specifically for the purpose. Placement of reinforcement cage to its full length shall be ensured before concreting. Minimum clear cover to the reinforcement shall be 75 mm, unless otherwise mentioned.

2.3.48 Building Up of Piles: If any pile, already cast as per construction drawing, requires any extra casting due to any change in cut-off-level, then the pile shall be built up by using at least one grade higher concrete than specified for piles, ensuring proper continuity with the existing concrete and to the satisfaction of the Engineer. Necessary reinforcement, as per design requirement and suitable shuttering shall be provided, before casting the concrete. Surrounding soil shall also be built up to the required level by proper compaction, to ensure lateral capacity of the pile.

2.3.49 Breaking Off: If any pile already cast requires breaking, due to subsequent change of Pile's cut-off-level, then the same shall be carried out, not before seven days of casting without affecting the quality of existing pile, such as loosening, cracking etc., and to the satisfaction of the Engineer. If any pile is cracked, the same shall be replaced by the contractor at his own cost.

2.3.50 Bore Hole testing: Bore hole shall be made as per IS: 1892.

2.3.51 IMPORTANT CONSIDERATIONS, INSPECTION / PRECAUTIONS

(b) Contractor will ensure the layout of bridge and its component to the complete satisfaction of Engineer-in-charge before start of any work.

(i) While concreting uncased piles, voids in concrete shall be avoided and sufficient head of concrete shall be maintained to prevent inflow of soil or water into the concrete. It is also necessary to take precautions during concreting to minimise the softening of the soil by excess water. Uncased cast-in-situ piles shall not be permitted where mudflow conditions exist.

(ii) The drilling mud such as bentonite suspension shall be maintained at a level sufficiently above the surrounding ground water level to ensure the stability of the strata which is being penetrated all through the boring operation and until the pile has been concreted.

(iii) Where bentonite suspension is used to maintain the stability of the bore-hole, it is essential that the properties of the material be carefully controlled at stages of mixing; circulating through the bore-hole and immediately before concrete is placed. It is advisable to limit:

(a) The density of bentonite suspension to 1.05 g/cc and maintain it.

(b) The marsh cone viscosity between 30 and 40

(c) The pH value between 9.5 and 11.50

(d) The silt content less than 1 per cent

(e) The liquid limit of bentonite not less than 400 per cent

These aspects shall act as controlling factors for preventing contamination of bentonite slurry by clay and silt.

(iv) The bores shall be washed by bentonite flushing to ensure clean bottom at two stages viz. (a) after completion of boring and (b) prior to concreting after placing of reinforcement cage. Flushing of bentonite shall be done continuously with fresh bentonite slurry till the consistency of inflowing and outflowing slurry is similar.

(v) Tremie of 150mm to 200mm diameter shall be used for concreting. The tremie should have uniform and smooth cross-section inside, and shall be withdrawn slowly ensuring adequate height of concrete outside the tremie pipe at all stages of withdrawal. Other precautions to be taken while tremie concreting are:

(a) The sides of the bore-hole have to be stable throughout

(b) The tremie shall be water tight throughout its length and have a hopper attached at its head by a water tight connection.

(c) The tremie pipe shall be large enough in relation to the size of aggregates. For 20mm aggregate the tremie pipe shall be of diameter not less than 150mm and for larger size aggregate tremie pipe of larger diameter is required.

(d) The tremie pipe shall always be kept full of concrete and shall penetrate well into the concrete in the bore-hole with adequate margin of safety against accidental withdrawal if the pipe is surged to discharge the concrete.

(e) For very long or large diameter piles, use of retarding plasticiser in concrete is desirable.

2.3.52 Pile Data:

The contractor shall submit data in the following Proforma for each pile indicating all technical details along with date and time of various operations in adequate permanent forms/copies for record.

Proforma

(i) Reference No. Location (Co-ordinates) __ area.

(ii) Sequence of installation of piles in group

(iii) Pile diameter & type

(iv) Working level (Platform level)

(v) Cut off level (COL)

(vi) Actual length below COL

(vii) Pile termination level

(a) Start of socket (Level)

(b) Termination of pile (Level):

(viii) Top of finished concrete level

(ix) Date and time of start and completion of boring.

(x) Depth of ground water table in the vicinity.

(xi) Type of soil/ rock at pile tip

(xii) Method of boring operation

(xiii) Details of drilling mud (Bentonite) as used:

(a) Freshly supplied mud:

Liquid limit
Sand content
Density
Marsh viscosity

Swelling index,
PH value

(b) Contaminated mud:

Density
Sand content

(xiv) (a) Standard Penetration Test (SPT) Penetration for 100 blows at Socketing Level for reference pile:

(b) Unconfined Compression Strength (UCS) Value in rock (from the nearest bore hole): Core recovery (from the nearest bore hole):

(c) Rate of drilling in mm / hr:

(1) At start of socketing horizon
(2) At termination level

(xv) Date and time of start and completion of concreting.

(xvi) Method of placing concrete

(xvii) Concrete quantity

Actual:

Theoretical:

(xviii)Ref. number of test cubes

(xix) Grade and slump of concrete

(xx) Results of test cubes

(xxi) Reinforcement details:
Main reinforcement Stirrups: Type

No._____ No._____

Dia _____ Dia _____

Depth_____ Spacing_____

(xxii) Any other information regarding obstructions, delay and other interruption to the Sequence of work.

(xxiii) Pile bore log details (in brief).

2.3.53 Such structure or parts of the structure which fail or pass the specified tests, shall be removed from the site by the tenderer/contractor at his cost and the contractors shall redo the work. Payments made on account of the rejected structure/part structure work shall be recovered from the contractor and the work will be redone by him at the same rates.

2.4 GENERAL GUIDELINES AND SPECIFICATIONS FOR OPEN FOUNDATIONS:

2.4.1 EXTRACT FROM THE SECTION 2100 OF SPECIFICATION FOR ROAD AND BRIDGES WORKS, 5TH REVISION MORTH 2013 (The para / section reference in this Chapter refer to the MoRTH Specification Para/ Section).

2101 DESCRIPTION

The work shall cover furnishing and providing plain or reinforced concrete foundation placed in open excavation, in accordance with the drawings and these Specifications or as directed by the Engineer.

2102 MATERIALS

Materials shall conform to Section 1000 of **MoRTH** Specifications.

2103 GENERAL

A method statement indicating the following shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of construction of open foundation:

i) Sources of materials
ii) Design, erection and removal of formwork
iii) Production, transportation, laying and curing of concrete
iv) Personnel employed for execution and supervision
v) Tests and sampling procedures
vi) Equipment details
vii) Quality Management System to be adopted including Quality Manual

viii) Any other relevant information

Details of necessary arrangements for execution under water wherever necessary, shall be included in the method statement.

Dimensions, lines and levels shall be set out and checked with respect to permanent reference lines and permanent bench mark so that the foundations are located correctly and in accordance with the drawings.

Formwork, steel reinforcement and structural concrete for open foundations shall conform to Sections 1500, 1600 and 1700 respectively of **MoRTH** Specifications.

2104 WORKMANSHIP

2104.1 Preparation of Foundations

Excavation for laying the foundation shall be carried out in accordance with Section 300 of **MoRTH** Specifications. The last 300 mm of excavation shall be done just before laying of lean concrete below foundation. Excavation shall be made only to the exact depth as shown on the drawing. In the event of excavation having been made deeper than that shown on the drawing or as ordered by the Engineer, the extra depth shall be made up with M10 concrete in case of foundation resting on soil and with concrete of the same grade as that of the foundation, in case of foundation resting on rock. This shall be done at the cost of the Contractor and shall be considered as incidental to the work.

Open foundations shall be constructed in dry conditions and the Contractor shall provide for adequate dewatering arrangements, wherever required, to the satisfaction of the Engineer.

Where light blasting is required for excavation in rock or other hard strata, the same shall be carried out in accordance with Clause 302 of these Specifications. Where blasting is likely to endanger adjacent foundations or other structures, controlled blasting with all necessary precautions shall be resorted to.

2104.2 Setting Out

The plan dimensions of the foundation shall be set out at the bottom of foundation trench and checked with respect to original reference line and axis.

2104.3 Construction

i) Excavation for open foundations shall be carried out in accordance with Section 300 of **MoRTH** Specifications. For guidance regarding safety precautions to be taken, IS:3764 may be referred.

ii) For foundation resting on soil, a layer of M10 concrete of minimum thickness 1 00 mm shall be provided above the natural ground to provide an even surface to support the foundation concrete. Before laying of lean concrete layer, the earth surface shall be cleaned of all loose material and wetted. Care shall be taken to avoid muddy surface. If any part of the surface has become muddy due to over-wetting, the same shall be removed. If required, the M10 concrete may be laid to a thickness of more than 100 mm, as per the direction of the Engineer. No construction joint shall be provided in the lean concrete. For foundations resting on rock, the rock surface shall be cleaned of any lose material and then levelled with a layer of concrete of the same grade as that of the foundation, so as to provide an even surface.

iii) No point of the surface of the lean concrete, in the case of foundation on soil or the surface of hard rock, in the case of foundation on hard rock, shall be higher than the founding level shown on the drawing or as ordered by the Engineer. Levels of the surface shall be taken at intervals of not more than 3 meters centre-to-centre in each direction, subject to a minimum of nine levels on the surface.

iv) No formwork is necessary for the lean concrete layer. Side formwork shall be used for foundation concrete work. When concrete is laid in slope without top formwork, the slump of the concrete shall be carefully maintained to ensure that compaction is possible without slippage of freshly placed concrete down the slope. In certain cases, it may be necessary to build the top formwork progressively as the concreting proceeds up the slope. Reinforcement shall be laid as shown on the drawing.

v) Before laying foundation concrete, the lean concrete or hard rock surface shall be cleaned of all loose material and lightly moistened. Foundation concrete of required dimensions and shape shall be laid

continuously up to the location of construction joint shown on the drawing or as directed by the Engineer.

vi) The concrete surface shall be finished smooth with a trowel. The location of construction joint and its treatment shall be done as per requirements of Section 1700 of **MoRTH** Specifications. Formwork shall not be removed earlier than 24 hours after placing of concrete. Where formwork has been provided for top surface, the same shall be removed as soon as concrete has hardened. Curing of concrete shall be carried out by wetting of formwork before removal. After its removal, curing shall be done by laying not less than, 100 mm thickness of loose moistened sand free from clods or gravel, over the concrete. The sand shall be kept continuously moist for a period of 7 days. Before backfilling is commenced, the loose sand shall be removed and disposed of as directed by the Engineer.

vii) Normally, open foundations shall be laid dry. Where dewatering is necessary for laying of concrete, it shall be carried out adopting any one of the following methods or any other method, approved by the Engineer:

a) A pit or trench of suitable size, deeper than the founding level as necessary, is dug beyond the foundation excavation so that the water flows into it and the excavated surface at founding level is fully drained.
b) Water table is depressed by well point system or other methods.
c) Steel/concrete caissons or sheet piling are used for creating an enclosure for the foundations, which can subsequently be dewatered.

No pumping of water shall be permitted from the time ·of placing of concrete up to 24 hours after placement.

viii) In situations where foundations cannot be laid dry or where percolation is too heavy to keep foundation strata dry, concrete may be laid under water only by tremie. In case of flowing water or artesian spring, the flow shall be stopped or reduced to the feasible extent at the time of placing the concrete.

ix) Where blasting is required, it shall be carried out in accordance with Section 300 of **MoRTH** Specifications, observing all precautions indicated therein. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc., shall be taken to prevent any damage.

x) All spaces excavated and not occupied by the foundations or other permanent works shall be refilled with earth up to surface of surrounding ground with sufficient allowance for settlement. All backfill shall be thoroughly compacted and in general, its top surface shall be neatly graded. Backfilling shall be in accordance with Section 300 of **MoRTH** Specifications.

xi) In case of excavation in rock, the annular space around the footing shall be filled with M15 concrete up to the level of top of rock. Filling with M15 concrete shall also be carried out for excavations having depth up to 1.5 m in ordinary rock or 0.6 m in hard rock. In case, the excavations are even deeper so as to require further filling up to the level of top of rock, the same shall be done by boulders grouted with cement.

xii) Protective works, where provided shall be completed before the onset of floods so as to avoid the risk of the foundation getting undermined.

2105 TESTS AND STANDARDS OF ACCEPTANCE

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

2106 TOLERANCES

a)	Variation in dimensions	: +50 mm, -10 mm
b)	Misplacement from specified position in plan	: 15 mm
c)	Surface unevenness measured with 3 m straight edge	: 5 mm
d)	Variation of levels at the top	: ± 25 mm

2107 MEASUREMENT FOR PAYMENT

Excavation in foundation shall be measured in cubic meters in accordance with Section 300 of **MoRTH** Specifications, based on the quantity ordered or as shown on the drawing.

Lean concrete shall be measured in cubic meters in accordance with Section 1700 of **MoRTH** Specifications, based on the quantity ordered or as shown on the drawing.

Concrete in foundation shall be measured in cubic meters in accordance with Section 1700 of **MoRTH** Specifications, based on the quantity ordered or as shown on the drawing.

Reinforcement steel shall be measured in tonnes in accordance with Section 1600 of **MoRTH** Specifications, based on the quantity ordered or as shown on the drawing.

2108 RATE

The contract unit rates for excavation in foundation, lean concrete, including dewatering and blasting where required, concrete in foundation and reinforcement steel shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing open foundation as mentioned in this Section and as show on the drawings.

2.5 GENERAL GUIDLINES AND SPECIFICATIONS FOR SUPPLY OF REINFORCEMENT AND STRUCTRURAL STEEL

2.5.1 SUPPLY OF STEEL FOR VARIOUS WORKS:

Supply of steel to various specifications as required under various schedules in the contract are governed by the Technical specifications and Special Conditions specified hereunder.

All steel shall be supplied by the Contractor at the site of work and stacked, stored, protected and maintained by him at his cost till they are put into use. Any temporary structure required for storage of steel etc., has to be provided by the Contractor at his cost and should be removed after completion of the work. The DFCCIL will only provide suitable land for construction of the above temporary shed free of cost wherever available.

For supply and use of steel in various works, relevant IRS Codes Specifications, IS Specifications and Railways specifications will be applicable.

2.5.2 SPECIFICATIONS FOR STEEL:

2.5.2.1 The steel supplied by the contractor must satisfy any of the following material specifications as required for the work along with other concerned specifications.

(i) The reinforcement steel shall be Thermo mechanical Treated bars of grade Fe 500 D/Fe550D conforming / satisfying to IS 1786 (Upto date).

(ii) The structural steel shall be conforming to IS 2062 (Upto date) as specified. It shall have Sub quality 'B0' & Grade E250 (Fe 410) and E350 (Fe 490) as mentioned in the tender schedule and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans. 12 mm thick & above plates are fully killed and fully normalized / controlled cooled as mentioned in the tender schedule. 'B0' sub quality indicate the requirement of impact test at 0-degree temperature and should conform to Charpy Impact Test at 0-degree temperature in accordance with relevant I.S. Code.

(iii) Relevant other IS and IRS Specifications with regard to properties, testing and use of the above steel items also shall govern.

2.5.2.2 The contractor shall produce the manufacturers test certificate for each lot of supply satisfying the requirements of relevant IS specifications and at the specific frequency as laid down.

2.5.2.3 The Contractor shall arrange to carryout additional tests on physical properties of steel for every 50 metric tonne (t) of steel and for every change in lot / batch for reinforcement steel and structural steel at his cost. No extra payment will be made for conducting such tests and the agreemental rate is inclusive of above testing charges.

2.5.3 PROCUREMENT OF STEEL:

2.5.3.1 All Reinforcement steel (TMT bars) and Structural Steel shall be procured as per specification mentioned in BIS's documents – IS: 1786 and IS: 2062. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the Specifications.

These steel shall be procured only from those firms, which are Established, Reliable, Indigenous & Primary Producers of Steel, having Integrated Steel Plants (ISP), using iron ore as the basic raw material and having in–house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's (Government of India) guidelines.

However, only certain isolated sections of structural steel, not being rolled by ISPs, can be procured from the authorized re-rollers of ISPs or authorized licensee of BIS

having traceability system and who use billets produced by ISPs with the approval of Engineer.

2.5.3.2 The contractor shall have to submit the cash memo and challans along with the lot / batch of steel purchased in token of proof of purchase of steel from reputed dealers. Steel shall be approved by Engineer only after production of necessary certificates before use in works.

2.5.4 REINFORCEMENT AND STRUCTURAL STEEL:

2.5.4.1 Payment for supply of all types of steel shall be made for the quantity required / used as per the drawings issued from time to time. No payment will be admissible for quantity supplied in excess of the required quantity as per drawings. However, contractor will be permitted to take the excess quantity back by his own means, but no claim for payment for transportation so involved will be admissible. No payment will be made for more supply of steel at the site / excess used in Construction. No payment will be made for steel used in temporary or enabling works unless explicitly provided for in the Schedules. Steel for enabling/temporary works shall be arranged by the Contractor at his own cost.

2.5.5 STAGE PAYAMENTS FOR STRUCTURAL STEEL:

2.5.5.1 No Advance Payment shall be made. However, stage payment for manufacturer of steel girders shall be made as per Bills of Quantities by the DFCCIL for steel physically brought to site by the contractor.

2.5.5.2 Stage payment for steel will be released subject to the following conditions:

(i) The steel shall be delivered at site and properly stored under covered sheds in measurable stacks and separately maintained for various sizes, sections and dates of supply.

(ii) The quantities of steel shall be brought to the site only in such instalments that would facilitate smooth progress of work and consumed in reasonable time. The payment will be restricted to a maximum of 30% of the schedule quantity at any point of time.

(iii) Proper accountable in the Steel Register is to be maintained in the prescribed format at the site for the receipt and use of the steel.

(iv) Ownership of such steel shall be deemed to vest with the DFCCIL.

(v) Before releasing the stage payment, the contractor shall insure the steel at his own cost in favour of DFCCIL against theft, misuse, damages, fire etc.

(vi) The price variation claim for steel will continue to be governed as per extant PV clause and with reference to delivery at site.

(vii) The Stage payment will be made, only when the Engineer or his authorized representative certifies that the said quantity of steel is received at site and entered in the register and that in his opinion the steel is actually required in accordance with the contract.

(viii) No Stage payment is permitted for steel required for temporary and enabling works.

2.5.5.4 Any Stage payment found to be made against the materials brought to the site in excess over the actual materials consumed in work shall be recovered from the contractor dues.

2.5.6 OTHERS:

2.5.6.1 Reinforcement steel and structural steel, shall be stored in such a way so as to avoid distortion and to prevent deterioration by corrosion. All steel used should be free from loose Mill scale, loose rust, paints and oil covering / coating etc.

2.5.6.2 Steel material, for which stage payment has been availed by the Contractor, shall be property of DFCCIL and will be issued to contractor by Engineer whenever required for the work. Contractor will be solely responsible for guarding against theft / misuse of the consignment due to any cause what so ever. The stage payment will be made, only when the Engineer certifies that in his opinion that the materials are actually required in accordance with the contract. It is the responsibility of the agency to ensure that steel as per the requirement is brought to site as per approved drawings / requirements.

2.5.6.3 The contractor shall be bound to store the materials at site of work earmarked for the purpose by the Engineer and shall not remove from the site nor use for any other purposes than exclusively for execution of the work for which the materials are intended for. Safe guarding of the materials is the responsibility of the contractor even if the material is deemed to be owned by the DFCCIL and insurance etc., have been arranged by the contractor.

2.5.6.4 Contractor shall remove from site any steel materials rejected by the Engineer within reasonable time as specified by him.

2.5.6.5 Before the test pieces are selected, the Contractor shall furnish copies of the mill records of the reinforcement steel giving number of coils in each cast with sizes and identity marks to enable identification of the material with the bill produced.

2.6 GENERAL GUIDELINES AND SPECIFICATIONS FOR FABRICATION & ERECTION OF COMPOSITE PLATE GIRDER/ BOW STRING GIRDER AND SPECIAL CONDITIONS

2.6.1 GENERAL:

This chapter covers the supply of material, fabrication, assembly and erection of Composite Girder, Bow string Steel Girder and bearings.

The following are the brief specifications and general guidelines for fabricating and erecting the girders but not limited to.

For detailed technical specifications for fabrication and erection of girders, refer Indian Railways Unified Standard Specifications (IRUSS) (Works and Materials), 2010 amended up to date, Issued under the authority of Chief Engineer, Railway from time to time or as amplified, added to superseded by Additional Specifications if any, appended to or as modified from time to time and Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001) shall be followed.

The Road Over Bridges (ROBs) are to be constructed for eliminating level crossings between Khurja-Dadri Section of EDFC. Level crossing Nos., their chainages and span configurations of these are given below in table. The superstructure of ROBs composed of: -

(i) **Composite girder:** Composite girder is a combination of steel girders and RCC deck slab. These girders involve the use of shear connector also. For composite plate girder ROBs, there are five leaves (plate girders) in one composite girder. Width of all ROBs is 12.00m including two footpaths. These are two lane ROBs. Hence, Carriage way width of this bridge is 7.50 m. The superstructure includes two RCC crash barriers in all ROBs, two RCC railings as per approved drawings in case of composite girder. The wearing coat is made of plain concrete. The wearing coat is 80 mm thick. The cross-drainage slope of 1: 40 is in the deck slab to drain the water. 100 mm Dia UPVC pipe shall be used as drainage spouts.

(ii) **Bow string steel girder:** Bow string steel girder is also having a deck slab. These girders involve the use of shear connector also. Width of ROBs is 12.00m including two footpaths. These are two-lane and four-lane ROBs. Hence, Carriage way width of this bridge is 7.50 m. The superstructure includes two RCC crash barriers and two Steel railings. The wearing coat is made of plain concrete and is of 65 mm thick. The cross drainage slope of 1: 40 is in the deck slab to drain the water. 100 mm Dia UPVC pipe shall be used as drainage spouts.

In case of four-lane ROBs, each pier will accommodate two-lane of 7.5m width carriageway.

The RCC deck slab has been designed with design Mix Concrete with grade of Concrete M40. The environmental exposure condition of this area where 3 ROBs are being constructed is moderate. As per moderate condition, minimum grade of concrete required as per Addendum and Corrigendum slip no 12 of Concrete Bridge Code - 1997 is M30. Minimum grade of concrete requirement is for durability of the structure. Hence, M40 satisfies the codal provisions of Concrete Bridge Code.

SL. No.	Level Crossing No	Chainage of ROB (km)	Approx. Span configuration (m)	Remarks
1.	43	97/26-27	1x72.0m Bow String Girder	Deck type
2.	43	97/26-27	20 x 24m PSC Girder and RE wall	Deck type

The bearings used in these girders are POT, POT cum PTFE (Poly Tetra Floro Ethylene), Metallic Pin and Metallic Guide. These bearings have been either as per RDSO design in case of standard RDSO girder or to be designed by the contractor in case of non-RDSO girder. The contractor has to purchase the bearings from the approved manufacturers as per approved drawing.

Pin and Metallic Guide bearing has also been shown in the drawings of standard RDSO composite girders. These are used in Seismic Zone IV & V.

All Composite girder and Bow string steel girder are to be fabricated as per Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001).

High Strength Friction Grip Bolts (HSFGB) shall be used as per drawings of RDSO. Notes for use of HSFGB are given in drawing no. RDSO/B-11760/R.

For skew ROBs, Refer approved drawing.

Protection screen is to be provided as per RDSO Drawing No RDSO/ETI/0068 in each ROB.

The protective coating is to be given to the composite girder by metallizing with sprayed aluminium as recommended in RDSO drawings.

The Contractor will be required to develop jigs & Masters for each components of composite Girder. Same will be approved by DFCCIL authorized inspecting officials. Masters templates should be stored & handled carefully and should be used only for checking the correctness of the jigs from time to time.

All workshop fabrication shall be done using SAW (Submerged Arc Welding) process only. All welding, other than workshop welding, shall be done through Gas Shielded FCAW (Flux Core Arc Welding) process only.

SMAW (Shielded Metal Arc Welding) also known as Manual Metal Arc Welding shall NOT be permitted anywhere in the structure.

FCAW wire to be used shall be Flux Core Tubular consumable electrode to generate flux gas in addition to gas cover of CO2, Argon or /CO 2- Argon mixture only.

In FCAW process, wind screen and /or enclosures shall be providing around the welding location to prevent shielding gas from blown out.

Welding shall be performed on prepared metal surfaces free from rust, dust, moisture etc. And before every new pass, slag must be carefully chipped off from weld surface. Radiography test shall be conducted to ensure weld quality. Method of launching shall be approved by RDSO.

Pier and foundation used here are to represent arrangement of own string girder Actual dimensions of pier and foundation is site specific.

Staircase may be modified as per site requirement.

After successful inspection of the fabricated components, appropriate surface treatment i.e. metallizing shall be rendered & components transported to bridge sites.

Contractor will be responsible for making material dumping and girder erection yard as per the requirement for which no extra payment will be made by the DFCCIL to the Contractor.

2.6.2 Site Inspection

Tenderers are requested to inspect the site and carry out careful examination to satisfy them as to the nature of work involved and facilities available at the site. They should note carefully all the existing structures and those under construction through other agencies. They should also study the suitability of utilizing the different equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of locating their store yard, laboratory, staff quarters etc., and satisfy themselves with regard to the feasibility of transporting the plate girders from the yard to the final site of placement etc.

2.6.3 Brief Design Data

The Composite plate girder has been designed as per relevant IRS / IRC / RDSO codes.

2.6.4 Codes and Specifications:

The materials as well as execution of works shall be confirming to the following specifications and codes of practice (Latest Revision of the Specification /Codes & upto date correction slips to be referred).

2.6.4.1 Indian Railway Standard Codes and Specifications:

(i) IR Specification for Fabrication of steel girder bridge & Locomotives turn tables (fabrication specification)–SERIAL NO. B1-2001 issued by RDSO, Reprint - 2008 incorporating A & C slip upto 5 (upto date).

(ii) IRS: Welded Bridge Code

(iii) IRS: Steel Bridge Code

(iv) IRS: M-28 Specifications for electrodes.

(v) IRS: M-39 Specification for wire flux for SAW.

2.6.4.2 Indian Standard Specification:

(i) IS: 2062-2011 Specification for structural steel.

(ii) IS: 813-1986 Scheme of symbols for welding.

(iii) IS: 800-2007.

(iv) IS: 9595-1996 Manual for metal arc welding.

(v) IS: 818-1968 Code of Practice for safety and Health requirements in electric and gas welding operations.

(vi) IS: 5666-1970 Etch (Pre-treatment) Primer

(vii) IS: 104-1979 Specification for Ready mixed paint, brushing, zinc chrome, Priming

(viii) IS: 2339-1963: Aluminium paint

(ix) IS: 2004-1991 Carbon steel forgings for general engineering purposes.

(x) IS: 1852-1985 Rolling and cutting tolerances for hot-rolled steel products.

(xi) IS: 1148-2009 Rivet bars for structural purposes.

(xii) IS: 4353-1995 Recommendations of Sub-Merged Arc welding of mild steel and low alloy steel.

(xiii) IS: 3935-1966 (shear connector)

2.6.5 Materials

2.6.5.1 Steel (Plates and Rolled sections) should conform to IS: 2062-2011. It shall have Sub quality 'B0' & Grade E250/E350 as mentioned in the tender schedule and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans. 12 mm thick & above plates are fully killed and fully normalized / controlled cooled as mentioned in the tender schedule.

Material supplied by the manufacturers shall be ultrasonically tested as per codal provisions at the manufacturer's premises before dispatch. The contractor on receipt of supply in his factory premises/fabrication workshop may have to carry out random USFD testing as per standards laid down in various codes and verify them with the list received from manufacturers, if instructed by the inspection agency/ Site Engineer. Only tested steel shall be used for fabrication. The steel shall comply in all respects with the requirements of approved drawings and relevant codes and specifications and it may be noted that quality of steel used for fabrication shall be the essence of the contract & shall be rigidly followed.

2.6.5.2 Structural Steel shall be procured as per specification mentioned in BIS's documents – IS: 2062-2011. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the Specifications.

These steel shall be procured only from those firms, which are Established, Reliable, Indigenous & Primary Producers of Steel, having Integrated Steel Plants (ISP), using iron ore as the basic raw material and having in – house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's (Government of India) guidelines.

However, only certain isolated sections of structural steel, not being rolled by ISPs, can be procured from the authorized re-rollers of ISPs or authorized licensee of BIS having traceability system and who use billets produced by ISPs with the approval of Engineer.

2.6.6 Test Certificates & Testing

All materials for the work shall pass Mechanical test, Charpy test, Chemical Analysis, etc. prescribed by the relevant IS specifications or such other equivalent specifications.

For all materials including HSFG bolts, the contractor shall furnish copies of test certificates from the manufacturers including proof sheets, mill test certificates, etc. showing that the materials have been tested in accordance with the requirements of various specifications and codal provisions.

If any further testing of materials is required by Engineer in respect of these and other items, it shall be arranged for by the contractor at a reputed laboratory/National test house as approved by Engineer. For this, nothing extra shall be payable and accepted rates in the schedule of items shall be deemed to include this.

Even satisfactory outcome of such tests or analysis shall in no way limit, dilute or interfere with the absolute right of the Engineer to reject the whole or part of such materials supplied, which in the judgement of the inspecting authority does not comply with the conditions of the contract. The decision of the Engineer in this regard shall be final, binding and conclusive for all purposes.

The Engineer shall be empowered, at his/her discretion to make or have made under the supervision, any of the tests specified in the specifications mentioned herein in addition to such other tests as he/she may consider necessary, at any time upto the completion of the contract and to such an extent as he/she may think necessary to determine the quality of all materials used therein. In doing so, he/she shall be at liberty under any reasonable procedure, he/she may think fit to select, identify, have cut-off and take possession of test pieces from the material either before, during or after its being worked up into the finished product.

The Engineer shall also be empowered to call for a duly authenticated series of mechanical tests to be obtained from the maker for this material used in the work and to accept the same in lieu of other tests to the extent he/she deems fit. The Contractor shall supply the material required for the test pieces and shall also prepare the test pieces necessary.

The test shall be carried out by the Contractor, for which Contractor shall provide all facilities including supply of labour and plant. Engineer may at his/her discretion direct the Contractor to despatch such tests pieces as he/she may require to the National Test House or elsewhere as he/she may think fit for such testing purposes.

The Engineer may at his/her discretion, check test results obtained at Contractor's work by independent tests at National Test House.

The Engineer shall at all times be empowered to examine and check the working of the Contractor's plant before and after using it. Should the Contractor's plant be found, in the Engineer's opinion, unreliable, he/she is empowered to cancel any tests already carried out in this contract and have these tests carried out at any National Test House or elsewhere, as he/she may think fit.

2.6.7 Packing

All projecting plates or bars shall be kept in shape by timber or angle bars spiked or bolted to them and the ends of chord lengths, end posts etc. at their shipping joints

shall be protected and stiffened so as to prevent damage or distortion in transit as the Engineer may direct.

All threaded ends and machined surfaces are to be efficiently protected against damage in transit. The parts shall be transported in convenient lengths.

All straight bars and plates except small pieces are to be transported in convenient bundles temporarily riveted or bolted together or bound with wrought iron or suitable wire as the Engineer may direct. All bolts, nuts, washers, plates under 300mm square and small articles generally are to be packed separately for each span in cases each weighing when full not more than 350 kg or in strong petroleum casks, or barrels as approved by Engineer. If not entirely filled by the contents the space left shall be closely packed with wood shaving or other suitable material. HSFG & other temporary Bolts of different sizes shall be separately packed in bags, each bag having a label indicating its contents. A list of contents shall be placed on top of each case or cask.

2.6.8 Stacking Materials:

(i) The materials, on receipt at site, shall be carefully unloaded, examined for defects, checked, sorted and stacked securely on a level bed out of danger from flood and out of contact with water or ground moisture. All materials shall be available for inspection by the Engineer.

(ii) The materials shall be verified with the marking shown on the marking plan of part list, which shall be supplied by the manufacturers or the Engineer.

(iii) Any materials found damaged during transit or while unloading should be stacked separately and damaged portions shall be indicated by paint with distinctive colour. All such materials shall be dealt with under the orders of the Engineer without delay. If any component after receipt at site, has in the opinion of the Engineer or Purchaser, been damaged in transit, such component shall be replaced or repaired to the satisfaction of the Engineer or Purchaser free of cost.

(iv) All such damaged material shall be dealt with as per the orders of the Engineer. Badly damaged portions may require replacement. Slightly distorted parts may be straightened by gradual pressure without heat or annealing. Badly distorted or broken parts must be dealt with as the case demands and as directed by the Engineer.

(v) Where the work has been passed in the manufacturer's works as strictly interchangeable, all members bearing the same marks can be stacked together without reference to any particular span.

(vi) The tenderer shall unload the material promptly on delivery; otherwise the tenderer shall be responsible for demurrage charges.

(vii) On receipt of rolled steel at workshop or fabrication yard, they shall be carefully unloaded and stacked properly to avoid bending, twisting, corrosion etc.

2.6.9 Manufacturing – The whole work shall be representative of the highest class of workmanship. The greatest accuracy shall be observed in the design, manufacture and erection of every part of the work to ensure that all parts will fit accurately together on erection and similar parts shall be strictly inter changeable as explained interchangeability paragraph. The contractor shall state which of the following alternative methods of manufacture, he intends to adopt.

(i) The whole of work to be erected complete and pieces marked to place.

(ii) All spans to be made strictly interchangeable as specified below.

2.6.10 Interchangeability:

(i) Every span is to be temporarily erected complete in Contractor's works. and all parts as marked to their place, unless the whole of the work is made completely interchangeable by the use of steel jigs and hard steel bushes controlled by master gauges, in which case the first span must be completely erected to test the accuracy of the templates. Further spans or part span assemblies built from parts selected at random by the Engineer shall be erected from time to time to check the accuracy of the work as the Engineer may require.

(ii) If the work is considered interchangeable by the Engineer a simplified scheme of marking will be permitted, i.e. all pieces which are identical shall bear one distinguishing mark irrespective of the span to which they belong. Should the interchangeability not to the satisfaction of the Engineer, the whole of the spans must be erected complete and all parts marked to their place without additional charge. The tenderers must state in their tenders whether they intend to adopt complete interchangeability or not.

(iii) Under special arrangement with the Engineer, it shall be permissible for approved portions of the work to be despatched before complete erection of the first span, provided the Contractor satisfies the Engineer that such portions of the work are strictly interchangeable and will assemble correctly and accurately in the complete structure.

2.6.11 The tenderer may fabricate the steel work at his workshop or at the site of the work as is convenient to him. If the fabrication is done in his own workshop, the transportation of the fabricated materials may be done by Road or Rail transport at his own cost. The tenderer must inspect the approach roads right from the workshop

and should ensure that it would be possible for him to transport the materials by Road.

2.6.12 If the tenderer proposes to fabricate the steel at site, land / site would be given to the tenderer to make temporary workshop free of cost, if available, but on completion of work, the site would be restored to normal condition.

2.6.13 HSFG bolts shall be provided as per approved drawing.

2.6.14 The responsibility of custody of the materials, in Tenderer's workshop or site will remain with tenderer till the completion of work and then handed over to the DFCCIL.

2.6.15 All welding consumables (electrodes, wire, flux etc.) shall be procured only from the manufacturers approved by RDSO subject to final approval by Engineer.

2.6.16 Removal of Unused Materials etc:

(a) The contractor shall take steps as desired by the Engineer to ensure that rejected work is not resubmitted for inspection.

(b) On the completion of the work, the tenderer shall remove all his unused and surplus materials, plant, staging and refuse, or other materials produced by his operations and shall leave the site in a clean and tidy condition.

2.6.17 Fabrication

2.6.17.1 General:

The fabrication of the girders and its accessories shall be carried out by the contractor in his factory premises or in a well-established fabrication workshop to be set up by the contractor at bridge site or any other location as approved by the Engineer. The workshop staff shall have requisite experience, proven skill and experience in the technique of fabricating large components. Accuracy of fabrication shall be realized through controlled high precision jigs, fixtures and templates, which shall be inspected and passed by Engineer specifically approved in prior by CGM/ GM /ROB or CGM/Meerut, DFCCIL. The fabrication shall be preceded by Quality Assurance plans to be submitted by the contractor and every activity shall be documented in detail. The Quality Assurance Plans shall clearly indicate how individual processes such as cutting of raw steel, making, drilling, assembly bolting, welding, painting, handling etc. shall be monitored for quality. The quality parameters for monitoring shall be identified. These identified quality parameters shall also be specified in these quality plans. The contractor shall get these quality plans approved from Engineer before start of fabrication work. The Engineer shall be empowered to check the manufacturing process from time to time to ensure that

the work is executed as per approved quality plans. The quality records shall be submitted to Engineer for record, after completion of fabrication work.

The works of fabrication in contractor's fabrication shop will at all times be open for inspection by Engineer / agency as nominated by Engineer. Before dispatch of fabricated steel work from the shops, the same will be inspected in the contractor's fabrication workshop by Engineer who will thereafter issue inspection certificate.

Any defect noticed during inspection in the execution of work shall be rectified or replaced by the contractor at his own cost. The decision of Engineer or any other agency nominated for inspection as to be rectified or replaced, shall be final and conclusive.

2.6.17.2 Fabrication Drawings

The contractor shall prepare detailed shop drawings including drawing office dispatch lists (DODL's) on the basis of design drawings supplied by Engineer in such size and in such details as may be specified by Engineer. The shop drawings shall be submitted to Engineer in triplicate. No work of fabrication will be started without such approval being obtained. Contractor has to arrange the proof checking of the working fabrication drawings from the nominated Institution / Consultant. The cost will be borne by the contractor. Nomination of the Institution/Consultant for proof checking works will be decided by concerned CGM / GM / ROB, DFCCIL. Engineer will make all efforts to approve the drawings submitted by the contractor within reasonable time but no claim from contractor for any delay on this account shall be entertained by Engineer.

For Engineer's use and record, the contractor shall supply free of charge, four sets of prints on string paper and one set of neatly executed tracings of all approved detailed drawings and fabrication drawings, soon after communication of approval for use at site.

2.6.17.3 Maintenance of records by Fabricators

The records of fabrication shall be maintained by the fabricator in the registers such as Jigs register, HSFG bolt checking register, Material offering and inspection register, RDSO / Inspecting Agency inspection notes and compliance register, Welding procedure data register, Radiographic inspection register and Statement of material test certificates, etc. The formats are given in Appendix I of IRS B1 – 2001. Inspections will be carried out by the agency/official nominated by DFCCIL.

2.6.17.4 Tolerance in Fabrication

Fabrication tolerance for plate girders shall be as stipulated in Appendix II of IRS– B1– 2001.

All members of the girder and joints are to be either welded or bolted as shown in the approved structural drawings. No welding except where approved by the Engineer is to be carried out at site. All welding and bolting are to be carried out as per relevant IRS Specifications.

2.6.18 Steel Tape

The Contractor shall maintain a master steel tape of approved make for which he/she has obtained a certificate of accuracy from any National Test House or Government recognised institutions competent to do so.

2.6.19 Flattening and Straightening

2.6.19.1 All steel materials, plates, bars and structural shall have straight edges, flat surfaces and be free from twist. If necessary, they shall be cold straightened or flattened by pressure before being worked or assembled unless they are required to be of curvilinear form. Pressure applied for straightening or flattening shall be such as it would not injure the material and adjacent surfaces or edges shall be in close contact or at uniform distance throughout.

2.6.19.2 Flattening and straightening under hot condition shall not be carried out unless authorized and approved by the Engineer.

2.6.20 Planning and Shearing

2.6.20.1 Except where otherwise indicated, cutting of all plates and sections shall be affected by shearing or sawing. All edges shall be clean, reasonably square and true. Wherever possible the edges shall be cut in a shearing machine, which will take the whole length of the plate in one cut.

2.6.20.2 Should the inspection find it necessary; the cut edges shall be ground afterwards.

2.6.20.3 Planning or machining of the edges or surface shall be carried out when so specified in the contract drawings or where specifically ordered by the Engineer. Where machining is specified, the plates or all sections shall be cut in the first instance to such a size so as to permit not less than 3mm of metal being removed from each sheared edge or end, in the case of plates or sections of 12mm or less in thickness and not less than 6mm of metal being removed in the case of plates and sections exceeding 12mm in thickness.

2.6.20.4 The butting ends of all booms and struts where spliced shall be faced in an end milling machine after members have been completely fabricated. In the case of compression members, the face shall be machined so that the faces are at right angle to the axis of the members and the joint when made, will be in close contact throughout. At the discretion of the Engineer, a tolerance of 0.4mm may be permitted at isolated places on the butting line.

2.6.21 Flame Cutting

2.6.21.1 Flame cutting by mechanically controlled torch/torches shall be accepted both in the case of mild steel and high tensile steelwork. Provided the edge as given by the torch is reasonably clean and straight, plates may be cut to shape and beams and other sections cut to length with a gas cutting torch, preferably oxyacetylene gas should be used.

2.6.21.2 All flame cut edges shall be ground to obtain reasonably clean square and true edges. Draglines produced by flame cut should be removed.

2.6.21.3 Unless machining has been specifically provided for, special care is to be taken to ensure that ends of all plates and members are reasonably in close contact and the faces are at right angles to the axis of the members and joints, when made, are also reasonably in close contact.

2.6.21.4 Use of multi-head flame cutting machine having multiple oxy acetylene torches is desirable for higher productivity and reducing the distortion due to cutting operation. Plasma-arc cutting method can also be employed. This process offers less heat input causing less distortion.

2.6.22 Method of fabrication

Considering the length and height of span, jigs and fixtures shall be used to guide and support drilling of holes and fixtures during entire fabrication work.

Jigs after manufacture shall be checked and approved by Engineer or any other Inspecting agency as nominated by CGM / GM /ROB, /CPM, DFCCIL. Only approved and stamped jigs shall be used for fabrication.

2.6.22.1 Tack Assembly

Tack assembly is the next step in fabrication which assembles the components to get the form of component or girder. This activity is to be done carefully so that the final components/ girders are fabricated to correct geometric shape and the size is within the tolerance specified.

For tack assembly, the components shall be kept on a firm hard bed and shall be held in position using suitable fixtures so that once the measurements are taken to set a component at proper location, these shall not move till the final tack assembly is done. The entire work shall be done in area where arrangements for manipulating the member such turning over, shifting etc can be conveniently done using EOT or other type of cranes and suitable covered shelter for sufficient protection against the weather is available.

Quality of tack Welds: as per clause 24 of Welded Bridge Code,

(i) Tack welds shall be not less than the throat thickness or leg length of the root run to be used in the joint.

(ii) Length of the tack weld shall not be less than four times the thickness of the thicker part or 50mm whichever is the smaller.

(iii) Where tack weld is incorporated in a welded joint, the shape, size and quality shall be suitable for incorporation in the finished weld and it shall be free from all cracks and other welding defects. Tack welds, which have poor quality and can crack, shall be cut out, ground and re-welded.

(iv) Tack welds shall not be made at extreme ends of joints.

(v) Tack welds are equally important in the overall quality and performance of the girder and these shall also be made by qualified welders.

(vi) After the tack assembly is complete, the girder/ component shall be checked for dimensional accuracy as per clause 13 of IRS B1. Drilling Jig and tacked members shall be clamped to a fixture to avoid shifting of jig during handling and drilling.

Tack welding may be permitted only at ends or locations, which will eventually be cut and removed. No active part of the component shall be tack welded as this would initiate crack formation in service.

2.6.23 Template

The contractor shall supply and provide templates at his own cost. **No separate payment shall be made for this and accepted rates shall be deemed to include this aspect.** The templates throughout the work shall be of steel of similar category. The templates shall be used for marking of cutting materials and as well as for profile machining for girders. Templates shall be used for marking of drilling holes in steel structure. In case where actual materials from a bridge have been used as templates for drilling similar pieces the Engineer will decide whether these are fit to be used as part of finished structure.

2.6.24 Template Shop

Fully covered template shop consisting of uninterrupted steel or concrete floor as approved having true and correct level covering adequate area shall be provided by the contractor.

2.6.25 Drilling and Sub punching

All holes shall be drilled but the Contractor may, if he/she so prefers sub-punch them to a diameter 6mm less than that of finished holes, e.g. a punched hole which is to be drilled out to 25mm in diameter shall not exceed 19mm in diameter at the die end. When the bolt holes are to be sub-punched, they shall be marked with a centre punch and made with a nipple punch or preferably, shall be punched in a machine in which the position of the hole is automatically regulated. The punching shall be so accurate that when the work has been put together before drilling, a gauge 1.5mm less in diameter than the size of the punched holes can be passed easily through all the holes.

Holes for turned bolts, should be 1mm under drilled in shop and should be reamed at site to suit the diameter of turned bolt.

The steel bushes shall be case hardened by an approved process and checked for diameter after the heat-treatment. The bores of bushes shall initially have a tolerance of -0mm, 0.1mm. The tolerance shall be checked from time to time and when the bores exceed a tolerance of, -0mm, +0.4mm, the bushes shall be rejected. For this purpose, go and no-go gauges are to be used. Tolerances for checking jigs from master plates shall be +0mm-0.13mm.

The work shall be taken apart after drilling and all burrs left by the drill and the sharp edges of all the bolt holes completely removed.

Drifting to enlarge unfaired holes is prohibited. The holes required to be enlarged shall be reamed provided the Engineer permits such reaming after satisfying himself about the extent of inaccuracy and the effect of reaming on the soundness of the structure. The Engineer reserves the right to reject all steel work if the holes are not properly matched.

On completion of drilling of holes in each component and before shifting the jig, it shall be ensured that all holes are drilled to their correct diameter to reconfirm quality of work.

2.6.26 Temporary Bolts, Nuts & Washers:

Refer Cl.28.1 to CI.28.8 of IR Fabrication Specification Serial No. IRS-B1-2001 issued by RDSO.

Anchor bolts shall be provided in holes (max. dia 40 MM) made in pier top/pedestals.

Anchor bolts and nuts shall be hot dip galvanized 100 microns thick, as per IS: 4759.

2.6.27 Alterations in the Work:

The Contractor shall not in any case or in any circumstances have authority to make any alterations in, modifications of, substitution for, addition to, or omission of work or any method or system of construction, unless an alteration order in writing directing such alteration, modification, substitution, addition, omission or change shall have been given by the DFCCIL prior to the commencement of the work or part of work nor shall the Contractor be entitled to any payment for or in respect of any such alteration, modification, substitution, addition, omission or change may have been actually made and executed and no course of conduct shall be taken to be a waiver of the obligation and conditions hereby imposed.

All altered, modified, substituted, additional and changed work, labour and materials and all omitted work shall be valued by the Purchaser on the basis of the rates specified in the schedule.

2.6.28 Welding

Welded construction work shall be carried out generally in accordance with the provisions of Indian Railway Standard Welded Bridge Code and subject to further specifications given in the following paragraphs.

All welds should be done by submerged-arc welding process either fully automatic or semi-automatic. Carbon di oxide welding or manual metal-arc welding may be done only for welds of very short runs or of minor importance or where access of the locations of weld do not permit automatic or semi-automatic welding.

Except for special types of edge preparation, such as single and double 'U' single and double 'J' the fusion edges of all the plates which are to be joined by welding may be prepared by using mechanically controlled automatic flame cutting equipment and then ground to a smooth finish. Special edge preparation should be made by machining or gouging.

Site welding should not be undertaken except in special circumstances with the approval of the Chief Bridge Engineer. Site welding should be confined to connections having low stresses, secondary members, bracings etc.

Manual metal arc welding may be done taking adequate precautions as per IS:9595 and under strict supervision.

2.6.29 Welding Procedure

The welding procedure shall be such as to avoid distortion and minimize residual shrinkage stresses. Properly designed jigs should be used for assembly. The welding techniques and sequences, quality, size of electrodes, voltage and current required shall be as prescribed by manufacturers of the material and welding equipment. The contractor should submit full details of welding procedure in Proforma given at Appendix-V of IRS: B1-2001.

2.6.30 Sequence of welding and welding pass

For fabrication of welded Composite plate, channel shear connectors shall be welded on top flange plate prior to assembly of I-section. This facilitates correction of any distortion of flange plate developed during the welding of channel shear connectors.

In making a typical I-section four fillet welds are to be made. The welding sequence to be followed is indicated by number 1 to 4 as shown in the Fig. 3 of IR Fabrication Specification Serial No. IRS-B1-2001 issued by RDSO.

Whenever a square butt weld in a 10 or 12mm thick plate is required to be made, the sequence to be adopted is shown in Fig. 3 of IR Fabrication Specification Serial No. IRS-B1-2001 issued by RDSO.

2.6.31 Procedure Trials for welding and cutting

Where required by the Engineer, welding and flame cutting trials as per following shall be carried out and completed before fabrication on representative samples of materials to be used in the work, as follows.

(i) The samples of material shall be selected and marked by the ENGINEER when the materials for the work are inspected at the mills.

(ii) The trials of flame cutting shall be carried out in material representative of all thicknesses to be used in the work.

(iii) The welding & flame cutting trials shall be commensurate to the satisfaction of Engineer and the procedures to be adopted in the fabrication of work which shall include:

(a) Welding procedure in accordance with IRS Welded Bridge Code supplemented by IS 813 and IS 1980.

(b) Heat control techniques required to ensure that the flame cut surface of steel are suitable for inclusion in welds.

(iii) The trials shall include specimen weld details from the actual construction which shall be welded in a manner simulating the most unfavourable instances of fit-up and preparation. After welding the specimens shall be held as long as possible at room temperature but in any case, not less than 72 hours, and then shall be sectioned and examined for cracking. Six representative samples of each weld joint similar to joint used in fabrication of all components shall be prepared by qualified and certified welding operators.

(v) Procedure trials: Testing shall be to relevant IS code or if approved to BS 709. The following groups of tests shall be carried out with the type of welds.

(a) **Butt welds:** Transverse tensile test, transverse & longitudinal bend test with the root of weld in tension and compression respectively, charpy V-notch impact test.

(b) **Fillet welds:** Fillet weld fracture test.

(c) **Track welds:** Inspection for cracking.

(d) **All welds:** Macro examination.

Additional tests may also be carried out as per requirement and instruction of Engineer, the cost of which shall be borne by the contractor.

Shop welded joints will be radiographically examined for 100 %.

Following tests are normally performed on welds.

(a) Non-Destructive Tests (NDT):

- Visual inspection/profile gauge for dimensional check of size and throat thickness of weld.
- Etching test for penetration of joint.
- Magnetic particle or Ultra Sonic Pulse Velocity (USPV)
- Gamma Radiography & x-ray (only for butt welds)
- Dye penetration of all welding joints.

(b) Destructive Test:

- Tensile test
- Bend test
- Impact test
- Load test.

Once samples representing the weld joint used in fabrication of all components are tested and test results are found satisfactory, then approval shall be taken from the Engineer for the welding of built up components by approved welding operators. Welding Procedure Qualification Records (WPQR'S) shall include joint details, welding consumables (i.e. electrode/wire & flux combination), weld parameters (i.e.

welding current, wire feed speed), welding position, welding equipment carriage speed (for SAW process), are Length, arc voltage etc.

2.6.32 Preparation of Faces

Preparation of joint face: Except for special types of edge preparation such as single or double 'U' & 'J' joints, the fusion edges of all plates which are to be joined by welding shall be prepared by using mechanically controlled automatic flame cutting equipment with the cutting allowance.

It shall be ensured by Non-destructive tests that the fusion face and adjacent surface are free from cracks, notches or other irregularities that are likely to cause defects during service or interfere with deposition of the weld.

Fusion faces and the surrounding surface up to 50 mm shall be free from mill scale, moisture, oil, paint dirt or any other substance which may affect the quality of the weld, and same shall be removed by grinding or flame cleaning/grit blasting.

Details of joint, fusion faces, root face and gap shall be as per details given in fabrication drawing or as stipulated in IS:9595.

2.6.33 Welding Operation

Parts to be welded shall be assembled such that the joints to be welded are accessible and visible to the operator. Assembly jig and fixture shall be used for accuracy.

Manipulators should preferably be used to execute the sequence of welding without disturbance, in the most suitable position. Fixture shall maintain the alignment with minimum restraint in order to reduce the possibility of locked up stresses.

Run in and run out plate shall be provided for fabrication of built up members or truss to ensure that weld will start on run in plate and weld will stop on run out plate and thus avoid crater defects on the components.

The size and length of weld shall not be less than those specified in the drawing nor shall they be in excess of the requirement without prior approval of the Inspecting Officer. The location of weld shall not be changed without prior approval of the Engineer.

During design and detailing of component lengths, care is to be taken to avoid butt weld in built up members of truss. Therefore, it is essential to use only nearest size and length or rolled sections that have been procured to scheduled sizes and lengths by proper planning. No butt weld shall be carried out without approval of Engineer.

Fabrication of components subject to dynamic loading in the structure need careful inspection during fabrication by qualified, experienced and certified Engineer from contractor's side and final approval by Inspecting Officer. This inspection shall be carried out as stipulated in Indian Railway Welded Bridge Code before, during and after welding.

2.6.34 Precautions during welding

The Contractor shall submit list of weld joints of different combined thickness for approval of welding procedure for all members.

The welding of built up component shall be carried out only by approved welding operators and in accordance with **Welding Procedure Qualification Records (WPQR)**. WPQR's shall be prepared in advance and approved by the Engineer. Proper welding sequence shall be followed to avoid distortion and minimize residual shrinkage stress, and surface defects, within acceptable tolerance limits.

To ensure sound and defect free welding of built up members, record of welding adopted as per approved qualifying procedure shall be maintained in Performa prescribed in guidelines for welded fabrication issued by TPIA (Third Party Inspecting Agency) specifically approved in prior by CGM / GM /ROB, DFCCIL.

Any change during welding for fabrication of built up member, such as welding sequence, welding process, positioning, wire and flux combination joint details, increase or decrease in combined thickness of joint by 5 mm etc. shall be carried out only after representative samples test and procedure qualification, is accepted. **In no case deviation from WPQR's without approval of Engineer shall be adopted.**

2.6.35 Additional Precautions during Welding

Following precautions shall further be observed during fabrication.

(i) All equipments shall be provided with calibrated gauges to observe limits of variation for parameters prescribed in WPQR'S for welding current, arc voltage, speed of travel of equipment etc.

(ii) Covered shed for environmental control (particularly against dust, moisture and water) shall be provided to avoid entrapment of hydrogen which is likely to cause crack initiation in weld or under bed of weld (i.e. Heat Affected Zone HAZ). Also baking of flux use for submerged arc welding in oven for an hour at 200-degree C shall be carried out o ensure that no moisture is contained in flux during welding.

(iii) All tack weld shall be carried out by qualified and approved welder only. As tack weld will become part of the final weld, it shall be free from all cracks and other welding defects.

(iv) If multiple runs are used for fabrication of built up member, inter run cleaning shall be carried out and subsequent weld bed made only after approval of inspecting officer or his authorized representative. This is to check free defects in the weld. Also visible defects such as cracks, cavities, if any, shall be removed by grinding. It shall be ensuring during welding that craters are avoided.

(v) Stray arcing of components, which cause local hard spots or cracking of parent metal, shall be avoided.

(vi) Flux of approved quality will be permitted for use.

(vii) The Auto melt grade wire spools of wires for Submerged Arc Welding and Carbon Dioxide (CO2) consumables of only the approved quality will be permitted.

(viii) Pre Heat Treatment will be given to the consumables to remove the moisture if any.

(ix) No violation of welding procedure will be permitted on any account.

2.6.36 Technical Organisation/tools, equipments and plants

(A) Contractor should have qualified and trained manpower suitable to do the work in terms of technical specifications and contract conditions.

(B) Contractor should have suitable and adequate plants, machinery and equipments required to execute the work like:

(i) Cutting machine.

(ii) Radial drilling machine.

(iii) Edge milling machine, end milling machines.

(iv) Plate/structural steel straightening machine.

(v) Pneumatic grinding machine, drilling machines, chipping machines and wrenches etc.

(vi) Sand blasting equipment and metalizing equipments.

(vii) Welding machines.

(a). SAW

(b). MIG/MAG

(viii) Welding transformers3+

(ix) Cranes of adequate capacity.

(x) Suitable Jigs and fixtures.

(xi) To test the raw material and girders to conform to relevant specification, testing facilities, for the following should be available either in house or through outsourcing.

(a). Elcometer for measurement of thickness of paints.

(b). Steel measuring taps duly calibrated.

(c). Ultrasonic flow detection testing facilities for checking internal flaws.

(xii) Suitable Welding manipulator.

(xiii) Macro etching/DP or MP testing facilities.

(xiv) Tongue tester for measuring current and voltage.

(xv) Gauges for checking weld size throat thickness and edge preparation etc.

(xvi) All equipments must meet the requirements of corresponding IS, IRS or other international specifications.

(C) **Manpower:** Adequate No. of trained qualified welders shall be available with the contractor. The welder must be trained in accordance with the provision of IS: 817. They must be trained either from recognized welding institutes or by in house training, where proper training facilities exist. The welder must be tested as per requirements of IS: 7310 and proper records maintained.

List of equipments mentioned above is only indicated and not exhaustive. The firm shall be required to deploy all other machineries, tools & plants etc. required for successful completion of the work of fabrication, assembly and launching of the girders.

2.6.37 General: Bolting & Welding

Qualified trained and experienced supervision is essential at all times during fabrication, and for maintenance of records.

After welding of welded components, they shall be finished finally by grinding or matching with the help of a profile template. All the butting ends of components shall be faced in milling machine after members haven completely fabricated. In the case of compression members, the face shall be machined so that the faces are of proper angle as shown in drawing and the joint when made will be in close contact throughout within a gap tolerance of less than 0.15 mm. The Engineer may permit a tolerance of (-) 0.4 mm at isolated points in butting line.

2.6.38 PAINTING

Specification for metalizing and painting will be done as per Clause no 39.2.1 of Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001).

2.6.38.1 Surface Preparation

This is the most important factor in ensuring good performance of the steel girder. The surface should be clean, dry and free from contaminants and it should be rough enough to ensure adhesion of the paint film. However, it should not be so rough that the film cannot cover the surface peaks.

The cleaning of the surface shall be done initially with the use of emery paper, wire brushes, scrapers etc. for spot cleaning to remove rust, scale etc. Subsequently, sand blasting of the surface shall be done to remove rust, mill scale along with some of the base metal. This will be achieved by high velocity impact of abrasive material against the surface in accordance with the provisions of IS: 6586, which will also create a base for good adhesion. The abrasive material once used for cleaning heavily contaminated surface should not be reused even though re-screened. Washed salt free angular silica sand of mesh size 12 to 30 with a minimum of 40% retained on a 20-mesh screen shall be used for blasting. The material specifications and other requirements shall be as provided in Indian Railways Bridge Manual, 1998.

All site bolts, nuts and washers shall be thoroughly cleaned and dipped in boiled linseed oil. All machined surfaces are to be well coated with a mixture of white lead conforming to IS: 34 and Mutton tallow conforming to IS: 887 as per specifications before despatch to site. Nothing extra shall be payable to contractor on this account.

All the components in the floor and deck system in open web girders shall be metalized as IRS specifications.

2.6.38.2 Metal Spraying

The metal spraying shall be carried out as soon as possible after surface preparation but in any case, within such period that the surface is still completely clean, dry and without visible oxidation. If deterioration in the surface to be coated is observed by comparison with a freshly prepared metal surface of similar quality which has undergone the same preparation, the preparation treatment should be repeated on the surface to be coated

The wire method shall be used for the purpose of metallising the diameter of the wire being 3mm or 5mm. Specified thickness of coating shall be applied in multiple layers and in no case less than 2 passes of the metal spraying unit shall be made over every part of the surface. At least one layer of the coating must be applied within 4 hours of blasting and the surface must be completely coated to the specified thickness within 8 hours of blasting.

2.6.38.2.1 Purity of Aluminium

The chemical composition of aluminium to be sprayed shall be 99.5% aluminium conforming to IS: 2590.

2.6.38.2.2 Appearance of the Coating

The surface of the sprayed coating shall be of uniform texture and free from lumps, coarse areas and loosely adherent particles.

2.6.38.2.3 Thickness of the Coating

The nominal thickness of the coating shall be 150 µ(microns). The minimum local thickness, determined in accordance with procedure given in clause 2.5.38.3 below, shall be not less than 110 µ(microns).

2.6.38.3 Shop Painting

Any oil, grease or other contamination should be removed by thorough washing with a suitable thinner until no visible traces exist and the surfaces should be allowed to dry thoroughly before application of paint. The coatings may be applied by brush or spray. If sprayed, pressure type spray guns must be used. One coat of wash primer to IS: 5666 shall be applied first. After 4 to 6 hours of the application of the wash primer, one coat of Zinc chrome primer to IS: 104 with the additional proviso that zinc chrome to be used in the manufacture of primer shall conform to type 2 of IS: 51 shall be applied. After hard drying of zinc chrome primer, one coat of Aluminium paint to IS: 2339 (brushing or spraying as required) shall be applied.

2.6.38.4 Site Painting

After the steel work is erected at site a second cover coat of Aluminium paint to IS: 2339 (brushing or spraying as required) shall be applied after touching up the primer and the cover coat given in the shop if damaged in transit

2.6.38.5 Method for the Determination of Local Thickness

2.6.38.5.1 Equipment

Any magnetic or electro-magnetic thickness meter that will measure local thickness of a known standard with an accuracy of ± 10 percent.

2.6.38.5.2 Calibration of Instrument

Calibrate and check the meter on one of the following standards (as appropriate):

(i) (Applicable to magnetic and elecro-maganeticmeters other than the pull-off type) A soft brass shim, free from burrs, in contact with the grit-blasted surface of the base metal prior to its being sprayed. The thickness of the shim shall be measured by micro meter and shall be approximately the same as the thickness of the coating.

(ii) A sprayed metal coating of uniform known thickness approximately the same as the thickness of the sprayed coating to be tested, applied to a base of similar composition and thickness to the article being sprayed, grit-blasted in accordance with Clause 2.5.38.1.

2.6.38.5.3 Procedure

For each measurement of local thickness, make an appropriate number of determinations, according to the type of instrument used.

With instrument measuring the average thickness over an area of not less than 0.645 sq. cm, the local thickness shall be the result of the one reading.

With instruments having one or more pointed or rounded probes, the local thickness shall be the mean of three readings within a circle of 0.645 cm^2 area.

With meters having two such probes, each reading shall be the average of two determinations with the probes reversed position.

2.6.38.6 Method of Test for Adhesion

Using a straight edge and hardened steel scriber which has been ground to a sharp 30-degree point, scribe two parallel lines at a distance apart equal to approximately 10 times the average coating thickness. In scribing the two lines, apply enough pressure on each occasion to cut through the coating to the base metal in a single stroke.

2.6.38.7 Inspection

2.6.38.7.1 Determination of Local Thickness

The minimum local thickness shall be determined by the method described above.

2.6.38.7.2 Adhesion

The sprayed metal coating shall be subjected to an adhesion test using the method described above. If any part of the coating between the lines breaks away from the base metal, it shall be deemed to have failed the test Articles, which have been rejected shall have the defective sections blasted clean of all sprayed metal prior to re-spraying. Where the rejection has been solely due to too thin a coating, sprayed metal of the same quality may be added provided that the surface has been kept dry and is free from visible contamination.

2.6.39 Paints: Source & Quality

Paint and other accessories including those for metallising work will be supplied by the contractor. Paints manufactured by the following firms (or more) may be used subject to their being in the approved list of RDSO and final approval by the Engineer.

M/s. Jenson Nicholson. Paints
M/s British / Berger paints.
M/s. Shalimar Paints
M/s. I.C.I. paints
M/s.Nerolac. Paints

The contractor shall furnish to the Engineer, the date of manufacture of paint as certified by the manufacturers with the necessary container marking and test certificate for paint conforming to relevant IS code. In addition to this, he shall also submit the necessary vouchers in respect of paint purchased by him.

The Engineer reserves the right to get the paint tested at contractor's expenses as considered necessary by the Engineer. It the test results do not conform to relevant IS specifications fully, then the loss of paint shall be rejected and got removed from the contractor(s) storage. If the paint has already been applied it shall be removed.

In addition to above, the following tests are required to be carried out in the field.

- Weight per litre
- Consistency test
- Scratch test.
- Flexibility and adhesive test.

The Engineer reserves the right to reject the lot of paint even on the basis of field results.

2.6.40 Painting - General Instructions

Painting shall not be commenced till the surface preparation has been approved by the Engineer or his representative.

Sealed containers of paint of approved brand shall be used. The paint drums must be rolled, turned upside down and shaken before opening. The paint must be stirred well before use. Over stirring which results in invisible air bubbles etc, shall be avoided.

Where brush painting is accepted, the paint must be applied by means of flat brushes not more than 75 mm in width having soft flexible bristles conforming to IS: 384.

Round and oval brushes of approved quality conforming IS: 487 may also be used as per the instructions of the Engineer or his representative or inspecting officer.

All new brushes should be soaked in raw linseed oil conforming to IS: 77 for at least 24 hours before use.

The date of painting shall be marked with paint on the member.

2.6.41 Care during Painting

Paint should be mixed in small quantities sufficient to be consumed within one hour in the case of red lead paint.

The applied coat of paint shall be uniform, and free from brush marks, sack marks, blemishes, scratching, non-uniform thickness, holes, log marks, fuel staining, cracking, scaling, and other defects.
Paint shall be applied only on dry and clean surface free from moisture or dust (including scrapping dust).

Paint should be used within the prescribed life from the date of manufacture.

2.6.41.1 Each coat of paint shall be left dry till it sufficiently hardens before the subsequent coat is applied. Each coat of paint shall be inspected by the Engineer and certified as satisfactory before applying subsequent coat.

2.6.42 ASSEMBLEY & ERECTION

2.6.42.1 General

The contractor shall provide at his own cost all tools, machinery, equipment and erection material, including all temporary works and shall assemble all components in every respect as stipulated in the contract and in accordance with approved drawings and specifications.

Before starting the work, the contractor shall seek the Engineer's approval as to the method he proposes to follow and the type and suitability of equipment he proposes to use for assembly of girder components and launching of girder. The approval of the Engineer shall however not in any way relieve the contractor of the responsibility for the adequacy and safety of methods and/or equipments he proposes to use for carrying our work in full accordance with drawings and specifications.

All temporary work shall be properly designed and substantially constructed for the loads, which it will be called upon to support. Adequate allowance and provision of a lateral forces and wind loads shall be made according to local conditions and ensure that support shall not settle during erection.

When chains are used for lashing care must be taken to protect the edges of members from twisting and distortion, damage to paint and similar effects.

Temporary bracing shall be provided to take care of stresses caused by erection equipment or other incidental loads during erection.

The method uses for lifting and slinging flexible members shall be brought to the notice of the Engineer and shall be subject to his approval.

The contractor shall observe sufficient accuracy in the assembly of every part of the work to ensure that all parts fit accurately together.

2.6.42.2 Procedure for Assembly in Workshop & Site

The contractor is required to undertake test assembly of the girders in his fabrication workshop to prove accuracy of templates and Jigs. This assembly can be done in horizontal position. In case the fabrication workshop is set up by the contractor at bridge site itself the test assembly may be done at assembly platform and after testing of accuracy of jigs, fixtures & templates and the same assembly can be launched after bolting.

The test assembly shall be certified by Inspecting agency of the Engineer.

Launching of girders: once sufficient number of girders are assembled and the sub structure has been certified to be ready, launching of girders shall be taken up. The scheme for launching shall be approved beforehand by RITES LTD and any statutory clearances such as CRS sanction must be obtained. Launching can be done by any of the various methods such as using single crane, using multiple cranes, end launching or using derricks.

2.6.42.3 Erection for Open web girder

1. The joints of the chords shall be drifted, bolted and preferably riveted to their geometric out line.

2. All other members are to be elastically strained into position by external forces, so that as many holes as possible are fair when filled with rivets.

3. Drifting of joints shall be avoided as far as possible, and when necessary should be done with greater care and under close expert supervision. Hammers not exceeding 1 kg (2lb) in weight should be used with turned barrel drifts and a number of holes drifted simultaneously, the effect of the drifting being checked by observation of adjacent unfilled holes.

4. The first procedure during erection consists of placing camber jacks in position on which to support the structure. The camber jacks should be set with their top level and with sufficient run-out to allow for lowering of panel points except the centre by the necessary amount to produce the required camber in the main girders. It is essential that the camber is accurately maintained throughout the process of erection and it should be constantly checked. The jacks shall be spaced so that they will support the ends of the main girders and the panel points. The bottom chord members shall then be placed on the camber jacks carefully leveled and checked for straightness and the joints made and riveted up.

5. The vertical and diagonal web members, except the end posts, shall then be erected in their proper position of the bottom chords. Temporary top gussets, the positions of the holes in which they are corrected, for the camber change of length in the members, should be used to connect the top ends of the members. Given by the nominal outline of the girders. The verticals and diagonals shall then be riveted to the lower chords.

6. All panel points, except the centre, shall now be lowered by the amount to produce the correct camber in the main girders as shown on the camber diagram.

7. The top chord shall be erected pieces working symmetrically starting from the centre outwards, each piece being cambered in turn.

8. The temporary top gussets, if used, shall be replaced by the permanent gussets in the same sequence as the erection of the top boom members.

9. The end posts shall be erected last. The upper end connection should preferably be made first and if there is no splice in the end raker, the final closure made at the bottom end connection. If there is a splice, the final closure should be made at the splice.

10. When cantilever method of erection is used, the above procedure does not apply.

2.6.43 Care during Assembly at Workshop

2.6.43.1 Drilling & Drifting of Holes

Drilling of joints shall be avoided as far as possible and when necessary should be done with great care and under expert supervision. Hammers not exceeding 1kg (2 lb) in weight may be used with turned barrel drifts and a number of holes drifted simultaneously, the effect of drifting shall be checked by observation of adjacent unfilled hole.

Any apparent error in shop work which prevents the assembling and fitting of the mating parts by the proper use of drifts shall be investigated immediately.

As all work is rigidly inspected at the fabrication shop before dispatch, these difficulties should not arise and the cause could possibly be due to the use of incorrect components. It is usually important that parts be correctly handed. Should errors still persist, the matter shall be immediately reported to the Engineer who will decide what action is to be taken.

2.6.43.2 Inspection, Testing & Marking

All components shall be offered for inspection prior to painting. All approved components shall be stamped defect free, painted as per specifications prior to dispatch to bridge site.

On final finishing of each component, it shall be marked distinctly with paint with shipping mark for guidance, during assembly of component.

2.6.43.3 Stud shear connectors shall be subjected to the following tests:

The appearance test and test to check the fixing of shear studs shall be as per approved/RDSO drawings.

2.6.44 Transports from Workshop & Stacking at Site

All items fabricated in the workshop shall be marked and packaged with accompanying package list. The items after fabrication shall be transported by contractor to site by Rail/Road in a manner as to cause no damage to the components. Contractor shall be liable for all losses and damages in transit for the materials consigned by him till materials are erected and work completed and taken over by the Engineer. Insurance against loss or damage in transit, if any, shall be the responsibility of the contractor.

After identification & correct marking, all components of each girder shall be dismantled & similar components shall be grouped together & labelled; bolts and plates of each size shall be packed separately, after approval by the Engineer.

The packages shall be of such size by length & weight that they are safely transportable by Rail/Road. The components shall be provided with necessary packing to avoid damage to painting & members in transit.

Dimensions for transport shall be as per standard schedules.

2.6.45 Assembly at site

2.6.45.1 Holes

After drilling holes in temporary tack assembled components, the components shall be taken apart after match marking and all burrs left by drill and sharp edges of all holes shall be removed by spot grinding to ensure full contact when assembled.

Assembly fixture shall be used to build components for turned bolt connection. These connections will help realize correct position of member and matching of coaxial holes in opposite members besides true alignment and level.

After assembly, all blank holes shall be checked with plug gauge of diameter 0.8mm less than hole diameter, to check fair matching of holes before riveting / bolting.

2.6.45.2 Drifts

Drifts as per IRS specifications may be used for drawing light members into position, but their use on heavy members should be restricted to securing them in their correct position. In no case shall drifting be allowed to such an extent that holes are distorted. Drifting to enlarge unfaired holes is prohibited.

2.6.45.3 Making of joints

Cleaning of permanent contact surfaces: - Surfaces which will have permanent contact shall be removed of paints and mill scale down to bare metal, clean and dried and immediately a coating of zinc chrome red oxide priming to IS:2074 shall be applied. Care shall be taken to see that all burrs are removed and no surface defects exist before the parts are assembled.

2.6.45.3.1 Reaming

No reaming shall be undertaken without the written authority of Engineer or his authorized representative except for under drilled holes meant for turned bolts. The contractor shall supply special bolts to fill reamed hole, where reaming is approved. Record of all such variations shall be kept. However, these provisions should not apply for under drilled holes meant for turned bolts. Copies of all correspondence pertaining to the recourse of reaming and the use of oversize bolts shall be sent by the contractor for information to Engineer.

2.6.45.3.2 Service Bolts & Drifts

Joints shall normally be made by filling not less than 50% of the holes with service bolts and barrel drifts in the ratio of four to one. The service bolts are to be fully tightened up as soon as the joint is assembled.

2.6.45.3.3 In cases where the joints have to withstand stresses arising from special methods of erection, provision is to be made to take the whole stress that will or may occur. Cylindrical drifts and turned bolts shall be used to withstand such stresses and no reliance is to be placed on service bolts for this purpose. Up to a maximum of 40 percent of the holes of each member of the joint are to be filled with drifts and balance of strength required is to be attained with turned bolts. The position and number of the drifts and bolts will be decided by Engineer.

2.6.45.4 Painting of Joints

All surfaces, which are in permanent contact, shall be thoroughly cleaned down to the bare metal, to remove mill scale, grease etc. They shall be painted immediately before assembly with one coat of suitable primer and raw linseed oil freshly ground and the surface prepared for painting as per painting specification at Clause 2.5.38.

2.6.46 Assembly and Launching

The launching of girders shall be done as per approved drawings. For this purpose, the contractor shall submit in triplicate, detailed launching schemes of all the girders including design calculations, safety procedures and method statement with such plans, sketches and other details as may be necessary to determine the suitability and adequacy of the schemes proposed. The scheme will be checked by RITES Ltd. The methods adopted shall not, under any circumstances, cause the stresses

in various members of girder spans to exceed permissible and safe limits at any stage of launching. One copy duly approved by the Engineer shall be returned to the contractor.

For the Engineer's use and record, the contractor shall supply free of charge, four sets of prints of approved detailed drawings of assembly and launching schemes on strong paper with back of linen for use at site and one set of neatly executed tracings.

The launching system & procedure shown on enclosed drawings are purely indicative of the method proposed for launching for which the permanent members of the girders are designed. The contractor shall provide full structural details of the temporary members and their connections to the girder, along with necessary design calculations not only justifying member's sizes but also for the entire launching system adopted. Contractor will be responsible for getting approval of launching scheme submitted by him from the Engineer.

In order to ensure perfect fit of the temporary components, holes may be carefully drilled for the connecting members in between the girders in situ and T & F High tension grip bolts used.

The launching system shall be test tried if directed by the Engineer and no separate payment for this shall be made.

Nothing extra will be paid to the contractor for adopting any scheme for launching. All temporary members shall be removed after launching and may be taken back by the contractor. Erection gussets provided for connecting the members may be cut and edges ground as required by the Engineer.

2.6.47 Field Bolts, Nuts and Service Accessories

2.6.47.1 The work is to include supply of all units, bolts, nuts, washers etc. required to complete erection at site with an allowance for wastage etc. 12.5% of the net number of field bolts and washers required subject to a minimum number of five in each item.

2.6.47.2 The Contractor shall be responsible for supplying site rivets/bolts of approved length. The length of such bolts shall be verified by snapping a few bolts of each length in the presence of the Engineer.

2.6.47.3 Black hexagonal bolts (Service bolts) with nuts and ordinary platter's washers and drifts for use in the erection of the work shall also be supplied at 60% (45% bolts and 15% drifts) of the number of field bolts per span in each size (this includes wastage).

2.6.48 Temporary Strengthening

The launching arrangement may include fabrication of launching nose or restraining girders, sway restraining devices such as sway ropes, restraining cables etc. the supply and fixing of members for temporary strengthening of girder members to take care of erection stresses and strains and other relevant components for satisfactory and successful completion of the defined scope of work. Erection stresses must be kept within safe and permissible limits at every stage of erection.

The contractor has to make arrangements at his own cost for the steel for temporary arrangements including sway restraining devices for launching and temporary strengthening of girder, as may be required for the launching operations. The rate quoted should take into account these factors as nothing extra shall be paid.

2.6.49 Inspection and Rectification

During erection of girders, the contractor shall provide all facilities and permit the Engineer to inspect the field assembly, site bolting and erection of spans.

After inspection by the Engineer, the contractor shall identify cause of any defect, imperfection and/or fault noticed during such inspection and initiate corrective action as per the direction of the Engineer. All defects, imperfections of faults for which the contractor is liable under the contract, shall be made good by the contractor to Engineer' satisfaction and the cost of identifying and rectifying such defects, imperfection or faults shall be borne by the contractor.

A neat casting bearing the name of the contractor, the place and date of manufacture, the contact number and the standard of loading to be specified by the Engineer shall be bolted conspicuously on all girders. The drawing of the name plate shall be approved by the Engineer.

2.6.50 Erection & Equipment:

2.6.50.1 The Contractor shall provide at his/her own cost all tools, machinery, equipment and erection material necessary for the expeditious execution of the work and shall erect the structural steel and iron work, in every respect as covered by the contract and in accordance with the drawings and specifications.

2.6.50.2 If any labour, material, plant staging haulage and storage facilities are to be provided by the Engineer, details of such items and the conditions under which these are to be supplied shall be clearly specified in the contract agreements. In the absence of any such provisions in the agreement, the Contractor shall make his/her own arrangement for such items.

2.6.50.3 Before starting the work, the Contractor shall advise the Engineer fully as to the method he/she proposes to follow and the amount and character of equipment

he/she proposes to use, which shall be subjected to the approval of the Engineer. The approval of the Engineer shall not be considered as relieving the Contractor of the responsibility for the safety of his/her method or equipment or from carrying the work in full accordance with the drawings and specifications.

2.6.50.4 All temporary work shall be properly designed and substantially constructed for the loads, which it will be called upon to support. Adequate allowance and provision of a lateral forces and wind loads shall be made according to local conditions and ensure that support shall not settle during erection.

2.6.50.5 Careful and periodical inspection of plants shall be made by the Contractor to ensure that all tackle, ropes, chains and other important lifting gear and machinery are in good order and fit for service and well upto the capacity for which they are required.

2.6.50.6 When chains are used for lashing, care must be taken to protect the edges of members to avoid the marking and distortion otherwise caused.

2.6.50.7 Span erected upon staging shall be supported upon suitable blocks, which shall ensure that the girders shall be at the correct elevation and alignment when completed. If other methods of erection be adopted where staging in situ is not employed, special means shall be used to ensure this.

2.6.50.8 The method used for lifting and slinging flexible members shall be brought to the notice of the Engineer and shall be subject to his/her approval.

2.6.50.9 Temporary bracing shall be provided to take care of stresses from erection equipment or other loads carried during erection.

2.6.51 ADDITIONAL SPECIAL CONDITIONS:

2.6.51.1 Land:

DFCCIL will at its discretion, and, if available, arrange land free for use for contractor's office at sites, field workshop, stores, assembly and erection yard. Land required by the contractor for labour or staff colony or other purpose will have to be arranged by him at his own cost.

2.6.52.2 Further Drawing and Instructions:

(i) GGM / GM /ROB, /CGM, DFCCIL shall have full power to make and issue further drawings or instructions or direction from time to time as may appear necessary and proper to the contractor for efficient construction, completion and maintenance of the works. The contractor shall be bound by the same as fully as be if they had been mentioned or referred to in the contract, and the contractor shall not be entitled to any extra payment in respect of any work or materials shown or directed to be done supplied by such further drawings or

instructions required for completion of unless the GGM / GM /ROB, /CGM, DFCCIL have given an extra order for the same in writing.

(ii) The tenderer's rate should provide for cutting M. S. Plates for making out M. S. Flats from plates, in case M. S. Flats are not available, no extra payment for such cutting and grinding that may be necessary for converting M. S. Plates to Flats will be admissible.

(iii) If the works are required to be done in Railway Yards and Tracks are to be crossed, the tenderer shall inspect the site and make himself thoroughly acquainted with site condition and quote rate considering these aspects.

(iv) The work shall have to be done in such a manner that the normal working of the Railway within the railway yard does not get disturbed. No material/temporary structures should be kept adjacent to the running track which may infringe rail traffic. The contractor shall take necessary precaution to prevent/cause damage to the Railway property & staff during the execution of the work.

2.6.52.3Commencement of the Erection Work at site:

The contractor shall commence the erection work when and as soon as, but not until, he receives instructions from Engineer to do so. On such order being given, possession of site/authority shall be given to the contractor of such portion or portions of the site as the Engineer may determine.

2.6.52.4Contractor to Study Drawing & Specification etc. and His Liability:

The contractor shall be responsible for close scrutiny of the approved drawings supplied by the DFCCIL, for any discrepancies, error or omission in the drawings or other particulars indicated therein, the contractor shall approach the DFCCIL immediately for rectification of indicated therein, the contractor shall approach the DFCCIL immediately for rectification of such discrepancies, errors and omission. If any dimension/figure/features etc. on approved drawings or plans differ from those drawings or plans issued to the contractors at the time of calling the tender, the dimensions as figured upon the approved drawings or plans shall be taken as correct.

2.6.52.5 Contractor to Submit His Time Table:

The contractor shall submit a monthly progress of work done during the month by the 4th day of the following month. He will also give the programme of coming month by 25th of each month. The programme will be subject to alteration at the discretion of the DFCCIL officials.

2.6.52.6Any Doubted Points to be referred to the GGM / GM / ROB, /CPM, DFCCIL:

Should there be any doubt or obscurity as to anything to be done or not to be done by the contractor or as to these instructions or as to any matter or thing, the contractor must set forth such doubt or obscurity in writing and submit the same to GGM/ GM/ROB, /CGM, DFCCIL. Only such reply as the said GGM/ROB, /CGM, DFCCIL may be in writing given shall be taken as the authoritative interpretation of the point in doubt or obscurity.

2.6.52.7 Contractor'(s) Liability:

Any fitting, accessory or apparatus which may not have been mentioned in this specification or the drawings, but which are usual or necessary in the execution of such work, are to be provided by the Contractor without extra payment. The whole work must be completed in all details, whether mentioned in this specification or not, with the exception of such work as has been specified in the schedule of items to be separately provided for in the Contract.

Notwithstanding the specifications and conditions stated in the contract, the contractor shall keep the Engineer/ Employer authority fully indemnified and free from all liabilities and risks consequential to any lapse on his part in respect of material quality, standard of workmanship, accuracy of fabrication and the like. He shall provide all labour and material required for execution of the work as per all standards and specifications.

2.6.52.8 DFCCIL desires that successful contractor should establish (at his own cost) the fabrication workshop near the site only for close monitoring of all the quality aspects of this contract work. Contractor's request for establishing workshop/using workshop proposed/located away from the bridge site shall require prior approval.

2.6.52.9 Contractor shall establish fully equipped laboratory for all the tests required on materials/processes/products as per provisions of the contract, Specifications and the direction/approval of the Engineer. Costs of these are deemed to be included in the quoted rates. Prior approval of the engineer shall be obtained for non-installation of such testing equipments which cannot be installed in normal course due to any reason. However, engineer's decision (for installation and non-installation) in this regard shall be final binding and conclusive.

2.6.52.10 Site Facilities by the Contractor:

Contractor shall provide office / site facilities at the bridge site / other locations for ensuring smooth and efficient communication and work execution. Cost of these facilities deemed to be included in the quoted rates and nothing extra shall be paid for this item.

(i) Contractor shall supply round the clock electricity in site offices of DFCCIL located at the bridge during the entire contract work. Contractor shall also

maintain the electric fittings/wirings/plants of both the offices in the good condition.

(ii) To provide proper communication the contractor shall (at his own cost) establish inter office communication system between DFCCIL office, fabrication workshops and contractor's offices at site. Adequate number of intercom / telephone/ mobile sets or are similar suitable equipments as decided/approved by Engineer fully communicable shall be established in each of the above fabrication shops & at site of bridge work. The entire expenditure incidental to running and maintenance of above shall be borne by the contractor within quoted rates.

(iii) Contractor shall (at his own cost) depute / nominate safety officers(s) for supervising safety aspects of all works/process including enabling arrangements for execution and inspection of the work. Safety systems/arrangements should be made for each activity of fabrication/erection and its inspection and same should be certified by nominated safety officer. Special care/arrangements are required to be made for supervising the erection/launching process of such high girders and concreting in road deck: arrangements should facilitate satisfactory and fearless inspection of each activity of launching / erection.

2.6.52.11 Declaration of designed fabrication/assembly yard as a part of site:

DFCCIL may issue necessary declaration on specific request of the contractor subject in the condition that the workshop area is earmarked exclusively for fabrication of girder components for this bridge with separate entry/exit arrangements. This is with further stipulation that such an arrangement should be acceptable to excise department by way of a no objection certificate. Necessary follow up with Excise Department will be solely the contractor's responsibility. In the event of excise department not agreeing to such an arrangement, the contractor shall not have any claims whatsoever, and shall pay excise tax and other extant taxes as per extant rules within quoted rates and nothing extra would be payable to them on this account.

2.6.53 METHOD OF MEASUREMENT FOR PAYMENT

2.6.53.1 Measurement

For the purpose of payment, quoted rates apply to the weights of structural steel work calculated from final working drawings based on theoretical weights given in the producer's hand books/IRUSS (W &M),2010-Volume-I and using minimum square overall dimensions, no deductions being made for skew cuts, holes or notches. Each gusset shall be measured as equivalent to the dimension of the smallest enclosing rectangle. The rates items quoted by the tenderer shall include

all wastage. **The wastage of steel in the form of skew cuts etc. shall be the property of the contractor.**

Payment shall be made on the weight to be calculated in the accordance with the nominal weight of the sections as specified on the drawings. No deduction for holes and no addition for rivets/bolts/welds etc. shall be made.

The drawing office dispatch lists (D.O.D. Ls) when prepared according to procedure shall be submitted by the contractor to the Engineer for approval.

The payment for steel work as per item in the schedule of items shall be released in stages of accepted item rates for quantities executed, as mentioned in the tender schedule. The payment after receipt of material in fabrication shop shall be made on the basis of measurements contained in the supplier's vouchers, if required, these measurements shall be further verified by the representative of Engineer in charge by measuring dimensions/sizes of the sections and multiplying the same by standard weight. Sampling for actual weight of the sections shall also be done by him as per procedure and frequency prescribed by Engineer.

The payment for complete metallizing / painting of all components of girders including all accessories, painting of contact surface etc. including all labour and material, tools and plants, machinery required for all operations of work is included in the accepted rates of item in the schedule. Nothing extra shall be paid.

In the event of a dispute arising as to a portion of steel work, weightment shall be made in the presence of the engineer.

No separate payment shall be made for the field bolts, nuts and service accessories for temporary works.

The cost of temporary erection and testing at the Contractor's workshop, marking, packing and delivery at the site of work is to be included in the price quoted on the tender.

Rate include fabrication of all the types of battens, bracings, ties, stiffeners, packing, diaphragms, shop bolts / welding, T&F bolts, drifts, shop welds, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, lift and taxes complete including assembly of girders.

Rate of girder item includes assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position and lowering of girder on bearings.

Grouting of holes with epoxy-based compounds in the bed block for fixing of HD bolts/anchor pins of bed plates as directed by Engineer are included in the bearing rates.

Rate of girder item includes the Assembling, bolting with contractor's own material, erection, launching, lowering, aligning and placing at exact position as per approved scheme of steel plate girder for required span in proper level and alignment, grip bolts and with all necessary works like making holes.

The rate of girder item will inclusive of supplying /erection and dismantling of staging, scaffolding and other temporary arrangement required for assembling, erection, launching and lowering of the girder.

The rate shall be also inclusive of cold straightening of deformed bent girder parts before the assembling including contractor's all labour, materials T & P, testing etc. complete.

2.6.54 BEARING

POT and POT-PTFE bearings is applicable here as per RDSO drawings No. RDSO/B-11758/6R for 36m composite girder and RDSO/B-10411/9 for 60m Bow String Girder. Contractor shall arrange these bearings as per these drawings. For 72m Bow String Girder, bearings shall be design and supply according to RDSO drawing no. RDSO/B-10412/8. Its specification shall be referred to para 22.4 of Indian Railway Unified Standard Specifications (Works and Materials), Volume - II, 2010.

The bearing sets will be paid separately as per relevant item, but it includes the cost of H. D. Bolts also (If required).

Bearings shall be provided before concreting of deck slab is taken up.

Bearings shall be protected during concreting or providing holding down bolts' operations. Any mortar or foreign material contaminating the bearing shall be completely removed.

Manufacture & finishing of bearings shall be as per para 927.2 & 927.3 of IRC 83 Part III.

Manufacturing tolerances shall be as per para 927.1 of IRC 83 Part III.

Acceptance of bearing shall be as per para 928 of IRC 83 Part III.

Material to be used for pot, piston and top plate including all guides, lugs etc shall be of cast steel to IS 1030: 1989 grade 340-570W.

2.6.55 DEFLECTION TESTS:

The deflection test shall be carried out as per additional specifications. Load testing will be paid separately as per relevant item.

2.7 GENERAL GUIDELINES AND SPECIFICATIONS SPECIFICATION FOR PRESTRESSING

2.7.1 EXTRACT FROM THE SECTION 1800 OF 'SPECIFICATION FOR ROAD AND BRIDGES WORKS, 5TH REVISION MORTH 2013 (The para / section reference in this Chapter refer to the MoRTH Specification Para/ Section)

1801 DESCRIPTION

The work shall consist of imparting prestress to structural concrete members by stressing of wires/strands/tendons/cables with jacks of required capacity and holding them between appropriately designed anchorages fixed internally or externally to the members.

1802 GENERAL

The work shall be carried out in accordance with the drawings and these Specifications or as approved by the Engineer.

Structural concrete and untensioned steel for the production of prestressed concrete members shall conform to the requirements of Section 1700 and Section 1600 respectively, of **MoRTH** Specifications, unless specifically modified by requirements set forth in this Section.

1803 MATERIALS

1803.1 All materials shall conform to **Section 1000** of **MoRTH** Specifications.

1803.2 Sheathing

1803.2.1 General

The sheathing ducts shall be of the spiral corrugated type either in mild steel or HDPE or in PP for internal tendons. They shall be in as long lengths as practicable from considerations of handling and transportation without getting damaged.

External tendons shall be housed in either High Density Poly-Ethylene (HDPE) sheaths or metallic steel sheaths (plain or with protective coatings), which have smooth internal surfaces.

1803.2.2 M.S. Sheathing Ducts

The material shall be Cold Rolled Cold Annealed (CRCA) Mild Steel conforming to IS:513 intended for mechanical treatment and surface refining but not for quench hardening or tempering.

The material shall be clean and free from rust and normally be bright finished. However, where specified, as in case of use in aggressive environment, galvanized or lead-coated mild steel strips shall be used.

The sheathing shall conform to the requirements specified in Table 1800-1 and Appendix 1800/1. All the joints of sheathing shall be water tight and conform to provisions contained in Clause 1804.6.

Table 1800-1: Details of Ducts

No. of Strands/ Dia in mm	Diameter of Duct in mm		Thickness of MS Sheathing in mm	Thickness of HDPE Duct in mm
	Metallic	HDPE		
6/13	50	50	0.3	2.0
12/13	75	75	0.4	2.5
19/13	85	85	0.4	2.5
27/13	100	100	0.5	3.0
12/15	85	85	0.4	2.5
19/15	100	100	0.5	3.0
27/15	125	130	0.5	4.0

1803.2.3 Corrugated HDPE Sheathing Ducts

The material for the ducts shall be high density polyethylene or polypropylene with more than 2 percent carbon black to provide resistance to ultraviolet degradation. The ducts shall be corrugated on both sides. All tests on raw materials and tests to be conducted on the finished product, shall be in accordance with fib Technical Report Bulletin 7 "Corrugated plastic ducts for internal bonded post tensioning".

Each batch of the HDPE ducts supplied to the site shall be accompanied by the supplier's certificate for properties of the raw materials which shall comply with the Technical Report Bulletin 7. In addition, the shore hardness for D-3 sec value shall be 60±5. For the approval of the finished product, the tests mentioned in the Appendix A1 to A9 of fib Technical Report Bulletin 7, shall be conducted at the reputed institutions or at the manufacturer's laboratories. Results shall comply with the provisions of the fib Technical Report Bulletin 7, except for the wear resistance, minimum bending radius and bond length test which are modified as follows:

Wear resistance test: The wear resistance of the duct i.e. the minimum residual wall thickness after loss, shall not be less than 1.5 mm for ducts up to 85 mm in diameter and not less than 2 mm for ducts greater than 85 mm in diameter.

Minimum bending resistance: The test apparatus shall be identical to the wear test apparatus with the same clamping force. However, sample shall not be moved but shall be as held in position for a period of 7 days. The residual wall thickness shall be as mentioned in (a) above.

Bond length test: The ducts shall transmit full tendon strength from the tendon to the surrounding concrete over a length of not greater than 40 times duct diameter.

Each supply of the ducts shall be accompanied by test report of the finished product also. The test certificates issued by the institutes will be valid for a period of two years.

1803.2.4 Diameter and Thickness of Sheathing Ducts

The internal diameter and thickness of sheathing shall be as shown in the drawing or as indicated in Table 1800-1, whichever is greater:

Where prestressing tendons are required to be threaded after concreting, the internal diameter of sheathing shall be about 5 mm larger than required above for spans more than 30 m. In severe environment, cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing or the sheathing shall be stiffened by other suitable method during concreting.

1803.3 Anchorages

1803.3.1 Prestressing accessories like jacks, anchorages, wedges, block plates, etc. shall be procured from authorized manufacturers only. Anchorages shall conform to "Recommendations for acceptance and application of prestressing systems" published by FIB. The prestressing accessories shall be subjected to an acceptance test prior to their actual use on the work. Test certificates from a laboratory fully equipped to carry out the tests shall be furnished to the Engineer. Such test certificates shall not be more than 12 months old at the time of making the proposal for adoption of a particular system for the project.

No damaged anchorages shall be used. Steel parts shall be protected from corrosion at all times. Threaded parts shall be protected by greased wrappings and tapped holes shall be protected by suitable plugs until used. The anchorage components shall be kept free from mortar and loose rust and any other deleterious coating.

1802.3.2 Swages of prestressing strand and button-heads of prestressing wire, where provided shall develop a strength of at least 95 percent of the specified breaking load of the strand or wire as the case may be. Where swaging/button-heading is envisaged, the Contractor shall furnish details of his methodology and obtain approval of the Engineer, prior to taking up the work.

1802.3.3 Untensioned steel reinforcements, around anchorages shall conform to the details of prestressing system and as shown on the drawing.

1803.4 Couplers

Couplers or other similar fixtures used in conjunction with the prestressing strands or bars shall have an ultimate tensile strength of not less than the strengths of the individual strands or bars being joined and shall also meet the requirements of individual anchorages.

1804 TESTING OF PRESTRESSING STEEL AND ANCHORAGES

All materials specified for testing shall be furnished free of cost by the Contractor and shall be delivered in time for tests to be made, well in advance of anticipated time of use.

All wires, strands or bars to be shipped to the site, shall be assigned a lot number and tagged for identification purposes. Anchorage assemblies to be shipped shall also be similarly identified.

All samples submitted shall be representative of the lot to be furnished and in the case of wire or strand, shall be taken from the same master roll. The Contractor shall furnish samples of atleast 5 m length selected from each lot for testing. Also, two anchorage assemblies, complete with distribution plates of each size or type to be used, shall be furnished along with short lengths of strands as required.

1805 WORKMANSHIP

1805.1 Cleaning

Tendons shall be free from loose rust, oil, grease, tar, paint, mud or any other deleterious substance.

Cleaning of the steel may be carried out by immersing in suitable solvent solutions, wire brushing or passing through a pressure box containing carborundum powder. However, the tendons shall not be brought to a polished condition.

1805.2 Straightening

High tensile steel wire and strand shall be supplied in coils of sufficiently large diameter, such that tendons shall retain their physical properties and shall be straight as they unwind from the coil. Tendons of any type that are damaged, kinked or bent shall not be used.

The packing of prestressing wire/strand shall be re moved only just prior to forming of cable for placement. Suitable stands shall be provided to **facilitate** uncoiling of wires/strands without damage to steel. Care shall be taken to avoid the possibility of steel coming into contact with the ground.

1805.3 Positioning

1805.3.1 Post Tensioning

prestressing tendons shall be accurately located and maintained in position, both vertically and horizontally, as per drawings.

Tendons shall be so arranged that they have a smooth profile without sudden bends or kinks.

The location of prestressed cables shall be such as to facilitate easy placement and vibration of concrete in between the tendons. High capacity tendons shall be used to reduce the number of cables thereby eliminating the necessity of grouping. The selected profiles of the tendons shall be such that their anchorages are not located in the top deck surface. Where two or more rows of cables have to be used, the cables shall be vertically in line to enable easy flow of concrete. The clear vertical and horizontal distance between any two cable ducts shall in no case be less than 50 mm or diameter of duct, whichever is greater, when grouping of cable· is not involved. Where precast segments are used, the clear distance between cables shall be at least 150 mm.

Sheathing shall be placed in correct position and profile by providing suitable ladders and spacers. Such ladders may be provided at intervals of approximately 1.0 m. Sheathing shall be tied rigidly with such ladders/spacer bars, so that they do not get disturbed during concreting.

The method of supporting and fixing shall be such that profile of cables is not disturbed during vibrations, by pressure of wet concrete, by workmen or by construction traffic.

Sheathing in which the permanent tendon will not be in place during concreting shall have a temporary tendon inserted or shall be stiffened by some other method to the approval of the Engineer. The temporary tendon shall be pulled out by a

special threading machine or other contrivance, before threading the permanent tendon.

Where possible, tendons shall be placed prior to stressing. Tendons shall be handled with care to avoid damage or contamination, to either the tendon or the sheathing. Any tendons, which are damaged or contaminated shall be cleaned or replaced.

1805.3.2 Pre-tensioning

Prestressing steel shall be accurately located and maintained in position, both vertically and horizontally, as per drawings.

1805.3.3 Each anchorage device shall be set square to the line of action of the corresponding prestressing tendon and shall be positioned securely to prevent movement during concreting.

The anchorage devices shall be cleaned to the satisfaction of the Engineer, prior to the placing of concrete. After concreting, any mortar or concrete which adheres to bearing or wedging surfaces, shall be removed immediately.

1805.4 Cutting

Cutting and trimming of wires or strands shall be done by suitable mechanical or flame cutters. When a flame cutter is used, care shall be taken to ensure that the flame does not come in contact with other stressed steel. The flame cutting of wire or strand shall be carried out at least 75 mm beyond the point where the tendon will be gripped by the anchorage or jacks.

In post tensioned members, the ends of prestressing steel projecting beyond the anchorages, shall be cut after the grout has set.

1805.5 Protection of Prestressing Steel

Prestressing steel shall be continuously protected against corrosion, until grouted. The corrosion protector shall have no deleterious effect on the steel or concrete or on the bond to concrete. Grouting shall conform to these Specifications or as directed by the engineer.

In the case of external prestressing, steel shall be encased in suitable polyethylene pipes before grouting.

1805.6 Sheathing Duct Joints

1805.6.1 General

The sheathing and all joints shall be water tight and shall withstand a pressure of 1.1 times the grouting pressure and maximum grouting head due to grout. Any temporary opening in. the sheathing shall be satisfactorily plugged and all joints between sheathing and any other part of the prestressing system, shall be effectively sealed to prevent entry of mortar, dust, water or other deleterious matter. Sheathing shall be neatly fitted at joints without internal projection or reduction of diameter.

Enlarged portions of the sheathing at couplings or anchorages shall be of sufficient length tq- provide for the extension of the tendons.

Special attention shall be paid to the junction at the anchorage end, where the sheathing must be tightly fitted on the protruding trumpet end of anchorage and thereafter sealed preferably with tape, to make it water-proof.

1805.6.2 Coupling of MS Sheathing Ducts

For major projects, the sheathing duct should preferably be manufactured at the project site utilizing appropriate machines. With such an arrangement, long lengths of sheathing ducts may be used with consequent reduction in the number of joints and couplers.

Where sheathing duct joints are unavoidable, they shall be made cement slurry tight by the use of corrugated threaded sleeve couplers, which can be tightly screwed on to the outer side of the sheathing ducts.

The length of the coupler should not be less than 150 mm but should be increased upto 200 mm, wherever practicable. The joints between the end of coupler and duct shall be sealed with tape to prevent penetration of slurry during concreting. The couplers of adjacent ducts shall be staggered wherever practicable. As far as possible, couplers should not be located in curved zones. The corrugated sleeve couplers can be conveniently manufactured using the sheath making machine with the next higher size of die set.

For typical details of coupling refer Appendix 1800/1 of **MoRTH** Specifications.

1805.6.3 Coupling of HDPE Sheathing Ducts

The HDPE sheathing can be joined by any one of the following three methods.

a) Use of threaded sleeve couplers in the same manner as given for metallic sheathing.

b) Welding of two ends of HDPE sheathing using appropriate machine such as Roaster Machine or Mirror Machine.

c) Use of heat shrink couplers made of HDPE sleeves. The sleeves are integrated with the parent sheathing by hot process by using heating torch.

For typical details of coupling, refer Appendix 1800/1 of **MoRTH** Specifications

1805.7 Grout Vents

Grout vents of at least 20 mm diameter shall be provided at both ends of the sheathing and at all valleys and crests along its length. For cables longer than 50 m grout vents or drains may be provided at or near the lowest points. Additional vents shall also be provided along the length of sheathing such that the spacing of consecutive vents do not exceed 20 m. Each of the grout vents shall be provided with a plug or similar device capable of withstanding pressure of 1.0 MPa without leakage of water, air pressure or grout .

1805.8 Anchorages

All bearing surfaces of the anchorages shall be cleaned prior to concreting and tensioning.

Anchor cones, blocks and plates shall be securely positioned and maintained during concreting such that the centre line of the duct passes axially through the anchorage assembly.

The anchorages shall be recessed from the concrete surface by a minimum of 100 mm.

After the prestressing operations are completed and prestressing wires/strands are cut, the surface shall be painted with two coats of epoxy of suitable formulation having a dry film thickness of 80 microns per coat and entire recess shall be filled with concrete or non-shirk/ pre-packaged mortar of epoxy concrete.

1806 SUPERVISION

Prestressing operation and grouting shall be entrusted only to specially trained and qualified personnel. All prestressing accessories shall be procured from authorized manufacturers with in-house testing facilities. The Contractor shall be required to engage specialized agencies who should also be entrusted with the total service contract for fabrication of cables, protection of cables during concreting, prestressing and grouting. Necessary certificates shall be accorded by such specialized agencies that the work has been carried out in accordance

with prescribed specifications. In exceptional cases, the prestressing and grouting operations could be entrusted to the bridge Contractor himself, if the Employer is convinced that he is well experienced and has qualified personnel and sufficient track record to substantiate his performance in the particular system of prestressing being adopted,

1807 TENSIONING EQUIPMENT

All tensioning equipment shall be procured from authorized manufacturers only and be approved by the Engineer prior to use. Where hydraulic jacks are used, they shall be power- driven unless otherwise approved by the Engineer. The tensioning equipment shall satisfy the following requirements:

i) The means of attachments of the prestressing steel to the jack or any other tensioning apparatus shall be safe and secure.

ii) Where two or more wires/strands constitute a tendon, a single multi-pull stressing jack shall be used, which is capable of tensioning simultaneously all the wires/strands of the tendon. Suitable facilities for handling and attaching the multi-pull jack to the tendons shall be provided

iii) The tensioning equipment shall be such that it can apply controlled total force gradually on the concrete without inducing dangerous secondary stresses in steel, anchorage or concrete.

iv) Means shall be provided for direct measurement of the force by use of dynamometers or pressure gauges fitted in the hydraulic system itself to determine the pressure in the jacks. Facilities shall also be provided for the liner measurement of the extension of prestressing steel to the nearest mm and of any slip of the gripping devices at transfer.

All dynamometers and pressure gauges including a master gauge shall be calibrated by an approved laboratory immediately prior to use and then at intervals not exceeding 3 months and the true force determined from the calibration curve.

Pressure gauges shall be concentric scale type gauges accurate to within two percent of their full capacity. The minimum nominal size of gauge shall be 100 mm. The gauge shall be so selected that when the tendon is stressed to 75 percent of its breaking load, the gauge is reading between 50 percent and 80 percent of its full capacity. Suitable safety devices shall be fitted to protect pressure gauges against sudden release of pressure.

Provision shall be made for the attachment of the master gauge to be used as a check, whenever requested for by the Engineer.

Jack and pump shall be calibrated from an approved laboratory prior to use and then at intervals not exceeding three months.

1808 POST TENSIONING

Tensioning force shall be applied in gradual and steady steps, in such a manner that the applied tensions and elongations can be measured at all times. The sequence of stressing, applied tensions and elongations shall be in accordance with the approved drawing or as directed by the Engineer.

It shall be ensured that in no case, the load is applied to the concrete before it attains the strength specified on the drawing or as stipulated by the prestressing system supplier, whichever is more.

After prestressing steel has been anchored, the force exerted by the tensioning equipment shall be decreased gradually and steadily so as to avoid shock to the prestressing steel or anchorage.

The tensioning force applied to any tendon shall be determined by direct reading of the Pressure gauges or dynamo-meters and by comparison of the measured elongation with the calculated elongation. The calculated elongation shall be invariably adjusted with respect to the modulus of elasticity of steel for the particular lot as given by the manufacturer.

The difference between calculated and observed tension and elongation during prestressing operations shall be regulated as follows:

a) If the calculated elongation is reached before the specified gauge pressure, continue tensioning till the specified gauge pressure i: attained, provided the elongation does not exceed 1.05 times the calculated elongation. If 1.05 times the calculated elongation is reached before the specified gauge pressure is attained, stop stressing and inform the Engineer.

b) If the calculated elongation has not been reached at the specified gauge pressure, continue tensioning by intervals of 5 kg/sq. cm until the calculated elongation is reached, provided the gauge pressure does not exceed 1.05 times the specified gauge pressure.

c) If the elongation at 1.05 times the specified gauge pressure is less than 0.95 times the calculated elongation, the following measures must be taken, in succession, to determine the cause of this discrepancy:
   i) Check the correct functioning of the jack, pump and leads.
   ii) De-tension the cable. Slide it in its duct to check that it is not blocked by mortar which has entered through holes in the sheath. Re-tension the cable if free.

iii) Re-establish the modulus of elasticity of steel for the particular lot from an approved laboratory.
If the required elongation is still not obtained, further finishing operations such as cutting or sealing, should not be undertaken without the approval of the Engineer.

d) When stressing from one end only, the slip at the end remote from the jack, shall be accurately measured and an appropriate allowance made in the measured extension at the jacking end.

A complete record of prestressing operations along with elongation and jack pressure data shall be maintained in the format given in Appendix 1800/11 of MoRTH Specifications.

The number of stages of prestressing and grouting shall be kept to a minimum, preferably two in the case of simply supported girders.

1809 GROUTING OF PRESTRESSED TENDONS

Grouting of prestressed tendons shall be carried out in accordance with provisions given in Appendix 1800/111 of MoRTH Specifications. A record of grouting operations shall be maintained in the format given in Appendix 1800/IV of MoRTH Specifications.

1810 PRE-TENSIONING

1810.1 General

The planning and construction aspects of the tensioning bed, tensioning bench, abutments at location of anchorage, steam curing system, formwork of the concrete elements and arrangements for de-moulding, lifting, stacking and transportation of the pre-tensioned concrete elements are all specialized items of work and shall be entrusted to engineers specifically experienced in this type of work.

1810.2 Concrete Mix Requirements

Minimum cement content, maximum water cement ratio and other durability requirement shall be same as indicated in Table 1700-2 and Table 1700-3 of these Specifications except that minimum grade of concrete shall be M40.

1810.3 Form Work

All sides, bottoms and header forms shall be of steel or any other suitable material. Forms shall be of sufficient thickness, with adequate external bracing and shall be stiffened and adequately anchored to withstand the forces due to placement and vibration of concrete. All joints of form work shall be leak proof. The bottom shutter shall have arrangement to permit longitudinal movement of girder concrete, which occurs while imparting prestress. Identifying marks shall be placed on the girders

to indicate the correct orientation to ensure correct deboning locations, which may not be symmetrical, longitudinally.

1810.4 Laying of Deflected Tendons

For long span pre-tensioned girders, deflected tendons shall be used instead of the conventional straight tendons. This requires the use of hold-up/hold-down devices at each deflected location, in order to hold the tendons in the desired profile and location. A hold-down device normally consists of rollers attached to a vertical rod, which passes through the bottom form and is anchored to the form· substructure or foundation to resist the prestress force. The force which must be resisted by the hold-up/hold-down device, and therefore its size, depends on the number of deflected strands and the trajectory angles of the strands. The strand can be either tensioned after it is held in its deflected profile by means of hold-up/old-down devices or it can be tensioned first and then brought into its deflected profile. The number of deflected strands and their angle directly influence the size and cost of the holdup/hold-down devices.

1810.5 Production and Testing of Concrete

A fully automated, computer-controlled batching plant shall be used. The batching plant shall be provided with moisture measuring and compensating devices and automatic pump for dispensing admixtures.

Sampling and testing of concrete shall be as per Section 1700 of MoRTH Specification Additional cubes shall be prepared to determine the concrete strength at the time of removal of forms and transfer of prestress. Adequate number of samples shall be taken for this purpose, which shall be cured in identical conditions to those of the concrete of respective girders.

1810.6 Compaction, Removal of Form Work and Curing

Compaction of concrete may be achieved through needle vibrators or form vibrators along with needle vibrators. For casting of precast beams, any of the two commonly known techniques of precasting viz. (i) Long Line method or (ii) Short Line method maybe used.

The girders shall not be moved from the casting location until stipulated strength requirements have been attained. The concrete shall have attained a minimum compressive strength of 20 MPa at the time of removal of forms. Curing of concrete may be achieved through water or steam followed by water curing. Approved curing compound may also be used.

Longitudinal movement of the girders that takes place while releasing the prestress shall be suitably catered for. In case of long line method of precasting, adequate longitudinal gap shall be provided between girder ends during precasting, to accommodate projecting reinforcement and required length of the projecting strands.

1810.7 Stressing Bed for Pretensioning

The abutments and bed for pre-tensioning of tendons shall be designed to withstand the tensioning force.
A notice shall be displayed adjacent to the stressing bed showing the maximum tensioning force permitted.

Where concrete elements are cast and prestressed individually, the stressing bench or molds shall be rigid enough to sustain the reaction of the prestressing force without distortion.

In the long line method of prestressing, sufficient locator plates should be distributed throughout the length of the bed to ensure that the wires are maintained in their proper position during concreting. The moulds shall be free to slide in the direction of their length and thus permit the transfer of the prestressing force to all the concrete elements along the whole line.

Sufficient space shall be left in between the ends of concrete elements to permit access for cutting the strands/wires after transfer. Hold-downs or deflectors shall be used for holding or deflecting the tendons in required position firmly. Deflectors which are in contact with the tendon shall have a diameter not less than the tendon or 15 mm, whichever is more.

The tensioning force required to be applied as stated on the drawings shall be the force remaining in the strands/wires after all strands/wires have been anchored to the abutments of the stressing bed and after the anchorage slip has already taken place. The tensioning force shall be determined by direct reading of the pressure gauges or dynamo-meters and by the measured elongation after slip.

The Contractor· shall submit method of tensioning the tendons including the arrangement and layout of prestressing beds and all tendon deflection points, to the Engineer for approval before manufacture commences. The Contractor shall carry out trial stressing operations to establish the frictional resistance offered by the hold-downs and the slip during anchoring.

Debonding of strands, wherever required, shall be carried out using HOPE debonding tubes. PVC tubes shall not be permitted for this purpose. After pre-tensioning the strands and before concreting, a recheck shall be made to ensure that the debonding tubes are placed at the intended locations. Both ends of debonding tubes shall be effectively sealed against ingress of any cement slurry using epoxy putty or any other suitable material.

The Contractor shall also submit calculation showing that the hold-downs have been designed and constructed to withstand concentrated loads resulting from the application of the tensioning force.

1810.8 Pre-tensioning and De-Tensioning Operations

1810.8.1 Pre-tensioning of Strands

Pretensioning of strands may be carried out either using single-pull jack or multi-pull jack. In case of the former, it shall be ensured at each stage, that the strands are stressed symmetrically, so that the supporting system of the strands does not rotate or distort. This may be achieved through suitably designed moving trolley engaging the strands or any other suitable arrangement. Prestressing force shall be transferred to metallic spacer, trolley, etc. so that the force does not remain on the hydraulic system for long.

It is necessary to apply a small prestressing force, through hydraulic jacks to remove slackness of the strands. After removal of the slackness, the strands must be thoroughly examined to ensure correct alignment, including that of the debonding tubes; Reference marks for measuring elongation shall then be established and the full strand load is applied thereafter. loads indicted by the gauging system shall control the tensioning, with elongation checked on every strand.

It shall be ensured that the entire length of each strand between the grips is free of defects. This is of particular importance while precasting girders using long line method entailing, longer pieces of strands between the grips.

Transfer of prestress shall not proceed until the Engineer has approved the proposed method. Strands and deflection devices shall be released in such a pre-determined order that unacceptable tensile stresses are not induced in the concrete.

Prior to transfer of the force to the units, all strands shall be tested for tightness and any loose strands shall be reported to the Engineer, who will decide whether the affected units should be rejected.

The Engineer may require that strands be marked at each end of any unit to allow measurement of the pull-in of the strands.

The sequence of transfer of prestressing force shall be done strictly as indicated in drawings and ensuring that eccentricities of the prestressing force in the vertical and horizontal directions of the concrete element are minimum during the entire sequence.

The maximum slip of any tendon during transfer shall not exceed 3 mm for bottom strands and 5.5 mm for a top strands at any end of the concrete element. In case the slip exceeds above value, design of the member shall be got checked for the actual slip before acceptance.

1810.8.2 De-tensioning of Strands

Detensioning, in order to impart the prestress shall be effected gradually, so that there is no significant loss of bond due to slippage of strands and consequent increase in the transmission length. For detensioning, the trolley is pulled outward by a small distance, in order to release the metallic spacers, before releasing the prestressing force. Even when the Pretensioning is carried out through single-pull jack, the release of the force in all the strands, while imparting the prestress to the concrete, shall be simultaneous. It shall be ensured that, during this process, prestressing forces at any stage does not exceed 90 percent of 0.1 percent proof stress.

1810.9 Cutting of Strands

Cutting of strands shall be carried out carefully so as not to affect the untensioned reinforcement which is in their close proximity. Diamond bit saw shall be used to cut the strands. Strands and untensioned reinforcement shall be so arranged that the untensioned reinforcement and those strands which are required to be extended into the adjoining cast in-situ concrete, do not get affected during cutting operation.

Under factory conditions, flame cutting may be resorted to. Yellow flame should be used first to heat the strand without introducing undue stresses and then blue flame for the actual cutting. Heat cutting of strand shall be carried out symmetrically about the vertical axis of the members. One strand at a time on each side of the vertical axis for all girders in a long line shall be cut in the same manner. The above process shall be repeated till all the strands are cut. This will ensure gradual and uniform transfer of prestress to girders.

1811 PROTECTION OF ENDS

The exposed ends of the strands and the concrete surfaces of the ends of the units shall be wire brushed clean of all rust, loose mortar, grease and dirt.

The exposed ends of the strands and concrete surface within 50 mm of tendons shall be then abraded to provide a clean sound surface. An epoxy tar paint suitably formulated to give a dry film thickness of 80 microns per coat, shall then be immediately applied over the ends of the tendons unless otherwise directed.

A second coat of paint shall be applied prior to the drying out of the first coat.

1812 SAFETY PRECAUTIONS DURING TENSIONING

Care shall be taken during tensioning to ensure the safety of all persons in the vicinity.

Jacks shall be secured in such a manner that they will remain in position, even if their grip on the strand is lost.

No person shall be allowed to stand behind the jacks or close to the line of the tendons while tensioning is in progress.

The operations of the jacks and measurement of the elongation shall be carried out in such a manner and that the safety of all concerned is ensured.

A safety barrier shall be provided at both ends to prevent any tendon which might become loose, from recoiling unchecked.

During actual tensioning operation, warning signs shall be displayed at both ends of the tendon.

After prestressing, concrete shall not be drilled cut, chipped, or disturbed in anyway, without express approval of the Engineer.

No welding shall be permitted on or near strands nor shall any heat be applied to tendons. Any strand which has been affected by welding or weld spatter or heat shall be rejected.

1813 SURFACE PREPARATION

All surface coming in contact with deck slab/diaphragm shall be adequately prepared by green cutting, using surface retarders, by mechanical means to remove the laitance and just expose the aggregates. Usually, precast girders join the cast in-situ concrete of end diaphragms at the points of high shear stress. Therefore, it is extremely important to adequately prepare the end faces of the girders for effective bonding of the new concrete. This shall be done using suitable mechanical means (such as 100% hacking) to ensure that the course aggregates are just exposed. Surface retarders, may also be used for this purpose.

1814 TRANSPORTATION STORAGE AND HANDLING OF PRECAST GIRDERS

Precast girders shall be transported in an upright position. Points of support and the direction of the reactions with respect to the girder shall approximately be the same during transportation, and storage as when the girder is placed in final position.

Method of transportation should be planned in such a way that the vehicle employed transport the long girders can successfully negotiate the available road geometry. Adequate care shall be taken to ensure that the girder being transported does not topple due to unstable arrangement. For this purpose, height of the vehicle shall be kept as low as possible. This will also help in accommodating greater height of the system during transportation below existing bridges or through any other constraints. Girders should be transported only after 28-day concrete strength is achieved.

When members are to be stacked, they shall be firmly supported at such bearing positions as will ensure the stresses induced in them are always less than the

permissible design stresses. Further, inclined side supports shall be provided at the ends and along the length of a precast girder to prevent lateral movements or instability.

Care shall be taken during storage, hoisting and handling of precast units to prevent them from being cracked or damaged. Units cracked or damaged by improper storing or handling, shall be replaced by the Contractor at his cost.

Handling of precast girders from precasting location to the bridge site requires careful operation. Lifting location shall be strictly as indicated on the construction drawings.

Lifting devices generally consist of loops of prestressing strand or mild steel bars or any other suitable arrangement. If it is anticipated that embedded material for lifting devices will be cast into the face of the member that will be exposed to view or to corrosive materials in the completed structure, the depth of removal of the embedded material and the method of filling the resulting cavities, shall be as shown on the construction drawings. The depth of removal shall not be less than the clear cover required to the reinforcing steel. The cavity so formed shall be suitably grouted for protecting the embedded metal. Also, the projecting reinforcement shall be suitably protected against corrosion.

1815 TOLERANCES

1815.1 Permissible Tolerances for Structural Unit

The dimensional tolerances for precast girders shall be as under:

Length	± 10mm
Flange width and thickness	±5mm
Depth	±5mm
Web thickness	±5mm
Minimum surface unevenness	1.5 mm on 3 m template

1815.2 Tolerances for Prestressing Strands

Permissible tolerances for positional deviation of prestressing strands shall be as under:

Variation from the specified horizontal profile 5mm

Variation form the specified vertical Profile 5mm

Variation form the specified position in member 3mm

1816 TESTS AND STANDARDS OF ACCEPTANCE

The material shall be tested in accordance with these Specifications and shall meet the prescribed criteria and requirements

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

1817 MEASUREMENTS FOR PAYMENT

Prestressed concrete shall be measured in cubic meters. The volume occupied by mild steel reinforcement/HYSD bars, high tensile steel, sheathing and anchorages shall not be deducted.

High tensile (prestressing) steel shall be paid for separately. Its length, as actually incorporated in the finished work, shall be measured and weight calculated therefrom in tonnes on theoretical basis, for payment.

Anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grouting, non-prestressed steel reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing samples for testing, shall all be deemed to be incidental to and included in the item of high tensile steel and shall not be measured separately.

1818 RATE

The contract unit rate for cast in-situ prestressed concrete shall cover the cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting finishing as per directions of the Engineer, curing and other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to specifications. The contract unit rate shall also include the cost of making, fixing and removing of all centering and formwork required for the work unless otherwise specified in the contract.

For precast prestressed concrete members, the unit rate, in addition to above, shall also include the cost of all materials, labour, tools and plant required, manufacturing in casting bed, transporting and placing the members in their final position as shown on the drawings and as directed by the Engineer.

The contract unit rate for high tensile steel shall cover the cost of material, labour, tools and plant required for procuring, placing, tensioning, anchoring and grouting the high tensile steel in the prestressed concrete as shown on the drawings and as per specifications or as directed by the Engineer.

The cost of anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grout, non-prestressed steel reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing samples for testing, shall all be included in the unit rate. Rate shall

also include payments, if any, to be made to the supplier of the prestressing system, who has to monitor, ensure and certify the correctness of all operations.

2.7.2 BEARING

POT and POT-PTFE bearings is applicable here as per approved drawings for applicable span. Contractor shall arrange these bearings as per these drawings. Its specification shall be referred to para 22.4 of Indian Railway Unified Standard Specifications (Works and Materials), Volume - II, 2010.

The bearing sets will be paid separately as per relevant item, but it includes the cost of H. D. Bolts also (If required).

Bearings shall be provided before concreting of deck slab is taken up.

Bearings shall be protected during concreting or providing holding down bolts operations. Any mortar or foreign material contaminating the bearing shall be completely removed.

Manufacture & finishing of bearings shall be as per para 927.2 & 927.3 of IRC 83 Part III.

Manufacturing tolerances shall be as per para 927.1 of IRC 83 Part III.

Acceptance of bearing shall be as per para 928 of IRC 83 Part III.

Material to be used for pot, piston and top plate including all guides, lugs etc shall be of cast steel to IS 1030: 1989 grade 340-570W.

2.7.3 DEFLECTION TESTS:

The deflection test shall be carried out as per additional specifications. Load testing will be paid separately as per relevant item.

SPECIFICATION FOR REINFORCED EARTH CONSTRUCTION

2.8 EXTRACT FROM THE SECTION 3100 OF SPECIFICATION FOR ROAD AND BRIDGES WORKS, 5TH REVISION MORTH 2013 (The para / section reference in this Chapter refer to the MoRTH Specification Para/ Section).

3101 SCOPE

The work covers construction of reinforced soil structures together with the construction of earthwork in layers, assembly and placing of reinforcing elements and facia elements during the construction process and all associated works.

The work shall include the design and construction of the reinforced soil structure and ground improvement measures required, if any.
The reinforced soil retaining structures can be used as, (i) Reinforced soil retaining wall, (ii) Reinforced soil abutment, (iii) Reinforced soil slope.
Reinforced soil structures with slope face angles sleeper than 700 are categorized as reinforced soil walls and those with slope face angle less than 700 are considered as reinforced soil slopes.

3102 DESIGN

Guidelines for design are given in Annexure-1

3103 REINFORCING ELEMENT

3103.1 The reinforcing element shall be metallic in the form of strips (abutment alloy strip. Copper strip, carbon steel strip, galvanized steel strip, stainless steel strip, ladder) or mats of metal (steel grids, woven and welded steel wire meshes) or synthetic (PET, HDPE, PVA, PP) reinforcement in the form of grid or strip or strap or combination of metallic or synthetic or any other proprietary material which may be approved by the Engineer and shown on the drawings.

3103.2 Aluminum alloy strip shall comply with BS:1470 quality 5454 in the H 24 condition.

3103.3 Copper strip shall comply with BS :2870 quality C 101 or C 102 in the ½ H condition and shall have 0.2 percent proof stress of not less than 180 N/mm2.

3103.4 Carbon steel strip shall comply with BS EN 10025 or IS:2062 and have a silicon content of not more than 0.55 percent. The fabricated element shall be galvanized in accordance with IS:4759 and IS 2629 and the minimum zinc coating weight shall not be less than 1000gm/sqm.

The steel strips with minimum bearing and shear strength of 490N/mm2 shall comply with the requirements of BS EN 10025, Grade S 355 JR, or IS:2062 grade Fe 490. Except the elongation (on base metal) for which minimum 22 percent is acceptable.

The panel lugs shall be manufactured from hot-rolled steel strips with the same steel quality and grades as specified above, except that the minimum zinc coating weight not less than 600 gm/sqm.

All permanent metallic connectors (exposed to soil), tie strips and lugs shall be hot dip galvanized. Nuts/bolts (fasteners) shall be galvanized as per requirement of IS: 1367-Part 3. Nuts/bolts (fasteners) shall be of grade 10.9.

For all metallic components, where holes or penetrations are made through the reinforcing elements to accommodate connection such as bolts, pins, or other, the cross section thickness and/or width of metallic component shall be increased to account for section loss caused by the hole or penetration.

3103.5 Stainless steel strip shall comply with BS: 1449 (Part 2) quality 315 S 31 or 3/6 S 33 except that the material shall be cold rolled to provide a 0.2 percent proof stress of not less than 400 N/mm2 and the tensile strength shall not be less than 540 N/mm2.

3103.6 All metallic components buried in soil shall be of electrolytically compatible materials.

3103.7 Geotextile, Geogrids and other Geosynthetic Materials used as Reinforcing Elements

3103.7.1 Geotextile

High strength high tenacity geotextile fabrics used as reinforcement in the construction of reinforced slopes or in the base of reinforced soil structure as reinforcement, shall be considered as reinforcing element and shall satisfy all the requirements stipulated for Geosynthetic reinforcing elements, in Clause 3103.7.2.

Geotextile fabric used for separation, filtration and/or drainage shall satisfy the requirements given in relevant Clauses of Section 700 Geosynthetic.

3103.7.2 Geogrids

The manufacturer of geogrids, geotextiles, geostrips, polymeric strips or straps, polymeric ties or any other Geosynthetic material, including any proprietary Geosynthetic material, for use as reinforcing element shall fulfill the following requirements:

a) Shall have ISO (ISO-9001) or CE Certification for manufacturing process and quality control, and

b) The product shall have certification for use as soil reinforcing material from an agency accredited for certifying geosynthetic reinforcement products.

c) The manufacturer shall provide text reports from an independent laboratory with valid accreditation, for all the tests needed to establish all the reduction factors listed below

RF $_{CR}$ - Reduction factor for creep
RF $_{ID}$ - Reduction factor for installation damage
RF $_{W}$ - Reduction factor for weathering
RF $_{CH}$ - Reduction factor for chemical/environmental effects
f_s - Factor for the extrapolation of data

All the above factors shall be determined in accordance with the provisions of ISO/TR 20432- "Guide to the determination of long-term strength of Geosynthetic for soil reinforcement"

Project Specific Tests/Data

Test for the ultimate tensile strength shall be carried out on a random sample for each grade of reinforcement as per ISO-10319. The test results shall be accompanied by stress-strain curves showing strength at 2% and 5% strain and strain/elongation at failure.

The manufacturer shall also provide the results of ultimate tensile strength for each lot and all grades of reinforcement proposed for use in the project.

Annual Average Daily Temperatures (AADT)/design temperature of the project site shall be worked out and values of reduction factor for creep RF $_{CR}$ and for RF $_{CH}$ shall be provided as per procedures given in ISO/TO-20432.

Tests shall be carried out to provide values of

i) Pull-out coefficient as per ASTM D 6706 "Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil" and

ii) Coefficient of interaction between reinforced fill soil and geogrids as per ASTM D 5321-"Standard Test method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear method" or as per IS: 13326: Part 1-1992 "Method of test for the evaluation of interface friction between Geosynthetic and soil: Part 1 Modified direct shear technique" for all types of geogrids.

One set of project specific tests shall be conducted at third party accredited laboratory or at a reputed institute.

Each roll shall have at least one identification label with roll number and product type.

3104 EARTH FILL

The fill material in the reinforced soil zone shall have drained or effective angle of friction not less than 300, measured in accordance with IS:2720 (Part 13), by conducting a drained direct shear test. In case the fill material has 25 percent or more particles of 4.75 mm or larger, drained shear test using large shear box may be conducted (IS:2720: Part 39: Section 1)

Sieve Size	**Percentage Passing**
75 mm	100%
425 microns	0-60%
75 microns	less than 15
PI< 6	

Materials with more than 15 percent passing 75-micron sieve, but less than 10 percent of particles smaller than 15 microns are acceptable provided PI is less than 6 and angle of friction is not less than 30^0.

Fly ash may be used as fill material in reinforced soil walls provided its angle of internal friction is not less than 300 and PI is less than 6. Gradation requirements need not be completely satisfied. Reference may be made to IRC Guide lines on Use of Flyash in Road Embankments (IRC: SP-58). Fly ash shall also satisfy requirements concerning pH and environmental conditions of the fill vis-à-vis the reinforcement type as specified in Clause 3014.1.

The fill material used in the reinforced soil zone shall be free from organic or other deleterious materials and shall not react adversely (chemically, electrically or biologically) with the reinforcement material and/or facia material.

Properties of fill soil in the reinforced zone, unreinforced zone (or retained/back fill) soil and the foundation soil shall be determined accurately during the construction phase, as per quality assurance plans and directions of Engineer so as to ensure that these are the same as those considered in the design phase.
The fill soil in the unreinforced zone shall conform to the requirements specified in the design.

3104.1 Environmental Conditions of Fill

3104.1.1 Steel Reinforcement

Where galvanized steel reinforcement is used, the fill material shall be free draining granular material and shall meet the following requirements as per Table 3100.1.

Table 3100.1: Recommended Limits of Electrochemical Properties for Reinforced Fills with Steel Reinforcement:

Property	Criteria	Test Method
Resistivity	> 3000 ohm-cm	AASHTO T-288
pH	> 5 and < 10	AASHTO T-289
Chlorides	< 100 PPM	ASTM D 4327
Sulphates	< 200 PPM	ASTM D 4327

3104.1.2 Geosynthetic Reinforcement

Where Geosynthetic reinforcement is used for reinforcing elements manufactured from polyester yarn, pH value of the fill material shall be between 3 and 9, and for reinforcing elements manufactured from PVA, PP and HDPE, the pH value shall be greater than 3.

3105 FACIA MATERIAL

3105.1 The facing system shall be one of the following

a) Precast reinforced concrete panels
b) Precast concrete blocks and precast concrete hollow blocks
c) Gabion facing
d) Wrap around facing using Geosynthetics
e) Metallic facing, prefabricated in different shapes including welded wire grid and woven steel wire mesh
f) Other proprietary and proven systems.

Facing shall be sufficiently flexible to withstand any deformation of the fill and foundations.

The facia units to be adopted in the project shall be shown in the drawings and shall be approved by the Engineer.

3105.1.1 Precast Reinforced Concrete Panels

The minimum thickness of precast concrete panels shall be 180 mm including facing textures, logos and embellishments. The grade of concrete shall be minimum M35. The concrete shall be conforming to the requirements of Section 1700 of **MoRTH** Specifications.

Facia panel systems shall have provision of both horizontal and vertical gaps to prevent concrete to concrete contact. The horizontal gap between the facing elements shall be maintained by provision of Ethylene Propylene Diene Monomer (EPDM) pad. Bedding material shall consist of either cement mortar or a durable gasket seating such as resin bonded cork, bitumen bonded cork or EPDM.

The joints between the panels shall be covered from inside with non-woven geotextile strips glued to the facing element ensuring full coverage of joints. Synthetic glue shall be used for this purpose. The width of the geotextile strip shall not be less than 100 mm.

3105.1.2 Precast Concrete Blocks/Segmental Blocks/Modular Blocks

Precast concrete blocks are dry cast and shall be manufactured from fully automatic block making machines. The minimum grade of concrete shall be M 35 for all kinds of modular blocks. In case of hollow blocks, the hollow area shall not exceed 40 percent of the cross sectional area of the block. The outer side of the block shall have minimum thickness of 100 mm.

3105.1.3 Gabion Facia

Where gabion facia is used, it shall conform to the provisions of BS 8006-1:2010 and EN 14475 and made of mechanically fabricated and selvedge double twisted hexagonal mesh. Wire used for the double twisted mesh shall be hot dip galvanized as per IS:4826-heavily coated and soft type, with wire and mesh properties in accordance with EN-10223 with minimum Zn or Zn + alloy coating as per EN-10244 and 0.5 mm thick PVC coating as per EN-10245 and ISO-527.

3105.1.4 Wrap around facing using Geosynthetics

Where Geosynthetics, including geogrids are used as wrap around facia, these shall form a part of the reinforcing element. The wrap around shall have adequate length to resist pull out and the wrap around length shall be calculated on the basis of safety in pull out. Wrap around facia shall be protected by suitable means, against adverse effects of natural forces.

3105.1.5 Metallic, Facing, prefabricated in Different Shapes including Welded Wire Grid, Steel Sheet and Woven Steel Wire Mesh

Where steel sheet and steel grids facings are used for facing, steel for steel sheet shall be as per BS:1449-Part 1 and steel grids shall conform to BS:4482, BS:4483 and BS:4489.

Where mechanically woven steel wire mesh in wrap around form is used for facing, the steel wire mesh (IS:4826, IS:280, IS:13360, EN:10218, EN:10223, EN 14475) shall be with mechanical selvedging and bottom panel shall continue as an integrated tail mesh.

Where welded steel wire mesh units in wrap around form (EN:10079, EN:10080, and EN:ISO 1461, EN:14475) are used as facing, the bottom panel shall continue as an integrated tail mesh.

3105.2 Facia type adopted shall be given in the design and shown with complete details in the drawings. The system supplier shall provide any test data to satisfy the Engineer regarding the properties and suitability of the facia system adopted, if so required.

Where facia such as wrap around or gabion or welded wire and woven steel wire mesh facings have been used and where climate conditions are appropriate, a green finish shall be provided where specified.

3105.3 Connection between the Facia and Reinforcement

Connection between the facia panel and the reinforcing element shall be by using either nut or bolt, HDPE inserts with bodkin joint, hollow embedded devices, polymeric/steel strips/rods/pipes, fiber glass dowels or any other material shown in the drawings. The connection between the panel and the reinforcement shall provide for 100 percent of the long term design strength of the reinforcing element in continuity.

In case of modular block facia and other type of facia such as gabion facia, where the reinforcement is held by friction between the facia block and the reinforcement, the connection strength shall be determined as per ASTM D 6638 “Standard Method of Test for Determining Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units.”

The available connection strength shall satisfy the design requirements and shall not be less than the maximum possible tensile force that the reinforcement layer under consideration may be subjected to.

3106 CONSTRUCTION DETAILS

3106.1 Depth of Foundation

As strip footing, minimum 350 mm wide and 150 mm thick in M15 grade plain concrete, shall be provided at founding level to receive the facia or the bottom most reinforcement.

The depth of embedment below the finished ground level at the foot of the wall shall not be less than 1000 mm. In case rock is met above founding level, the depth of embedment shall be adjusted as per ground conditions.

3106.2 Laying of Reinforcement

The reinforcing elements shall be placed at right angles, to the face of the wall or design axis, with greater cross-sectional dimension in the horizontal plane and the

length shall be as shown in the drawings. Reinforcing elements such as geogrids, shall be stretched and held taut by driving nails or pegs at the farther end.

3106.3 Facing Batter

It may be necessary to set facing unit at an additional batter than as provided in the drawings since there is a tendency for initially positioned units of facia to lean outward as the fill material is placed and compacted. Care and caution shall be taken to accommodate this phenomenon. At the end of the construction, the face may have a slight residual inward batter.

3106.4 Drainage

Drainage bay shall be provided as shown in the drawings. The width of the drainage bay shall be 600 mm behind the facing element.

The drainage material shall conform to the specifications of the filter media as per Clause 2504.2.2 of these Specifications.

3106.5 Laying and Compaction

The reinforcing elements shall be laid free from all kinks, damage and displacement during placing, spreading, leveling and compaction of the fill. The programme of filling shall be such that no construction plant moves directly on the reinforcement.

All construction plant having a mass exceeding 1500 kg shall be kept at least 2.0 m away from the face of slope or wall.

In the area up to 2.0 m from the face of slope or wall, the following compaction plant shall be used:

i) Vibratory roller having a weight per metre width not exceeding 1300 kg with total weight not exceeding 1500 kg
ii) Vibratory plate compactor of maximum weight 1000 kg
iii) Vibro tamper having a weight not exceeding 75 kg

Before allowing the movement of vehicles over the reinforcement, a minimum compacted thickness of 150 mm shall be provided over the reinforcement and the speed of the vehicles shall be restricted to 10 km/hr.

During construction of reinforced fill, the retained material beyond the reinforcement at the rear of the structure shall be maintained at the same level as reinforced fill.

Fill shall not be placed on surface that contains mud, organic soil area that have not met compaction requirement.

The thickness of compacted layer shall not be more than 200mm, compacted to 97percent of maximum laboratory density measured as per IS:2720 (Part18)

3106.6 Construction and serviceability tolerance

The construction tolerances shall be as per the following.
Casting of pre-cast RCC panels: All elements shall be manufactured within the following tolerances:

- All dimension within+5mm

- Evenness of the front face +5mm over 1500 mm
- Difference between lengths of two diagonals: 5 mm max
- Thickness: 5 MM (-)0mm

Table 3100.2: tolerances for faces of Retaining Wall and Abutments Tolerance

Location of plane of structure	± 50mm- metallic reinforcement ± 75mm- synthetic reinforcement
Bulging (Vertical) and Bowing (Horizontal)	± 20mm in 4.5 m template (Metallic) ± 30mm in 4.5 m template (Synthetic)
Step at joints	± 10mm

Dimensional tolerances for Modular blocks

Dimensions of modular concrete blocks shall not differ more than ± 2.5 mm for length and width and ± 1.5 mm in height.

Minimum Vertical Movement Capacities of Facing Systems
Minimum vertical movement capacities required for facing system to cope with vertical internal settlement of reinforced fill shall be as below.

Table 3100.3: Minimum Vertical Movement Capacities of Facing Systems

Structure Form	**Minimum Vertical Movement capacity of System**
Discrete panels	Joint closure of 1 in 150 relative to panel height
Full height panels	Vertical movements capacity of connections 1 in 150 relative to panel height

Semi- Elliptical facing	Vertical distortion of 1 in 150 relative to panel height
Geotextile/ Geogrid wrap around facing	No specific limit except for appearance or serviceability

3106.7 Capping Beam Crash Barrier and friction Slab

Capping beam crash barrier and friction slab shall be provided as per the design and drawing.

3107 REINFORCING SOIL SLOPES

This section deals with construction of reinforced soil structures that have a slope face angle flatter than 70°.

3107.1 Reinforcing Elements

Any type of material used as reinforcing element for the construction of a reinforced soil slope shall meet all the requirements provided in the clause 3103. Any Geosynthetic material used as reinforced clement of the construction of a reinforced soil slope shall meet all the requirement in Clause 3103.7.

3107.2 Fill Material

The fill material used as the reinforcing fill in the reinforced soil slope shall meet all the requirements for fill material specified in Clause 3104. However, the friction angle of the fill material in this case shall not be less than 28°.

3107.3 Facia for reinforced soil Slope

Facia of reinforced soil slope shall be one of the following types

a) Wrap around facing using Geosynthetic
b) Gabion facing
c) Metallic facing, prefabricated in different shapes including welded wire gird and woven steel wire mesh.
d) Precast reinforced concrete panels
e) Precast concrete blocks and precast concrete hollow blocks.

The specification for the materials used for above facing types shall be as provided in **Clause 3105.1**

3107.3.1 Wrap Around Facia using Prefabricated Geosynthetic Bags

Where specified wrap around facia using prefabrication geosynthetic bags shall be used in the construction of reinforced soil slopes for slope angles less than 45 Such type of facia shall conform to the provision in EN:14475.

3107.4 Connection between the Facia and Reinforcement

Connection between facia and reinforcement in the reinforced soil slope shall satisfy the design requirements.

3107.5 Facia type adopted shall be given in the design and shown with complete details in the drawings. The system supplier shall provide any test data to satisfy the Engineer regarding the properties and suitability of the facia system adopted if so required by the Engineer.

Where facia such as wrap around or gabion or welded wire and woven steel wire mesh facings have been used and where climate conditions are approved a green finish shall be provided where specified.

3107.6 Laying and compaction

Laying of the reinforcement in the reinforced soil slope and the compaction of the fill shall conform to the provisions of Clause 3106.5

3108 SYSTEM RESPOSIBILITY, PERFORMANCE BND

3108.1 System responsibility

If specified in the control, the system supplier shall provide performance bond in conformance with the contract requirements. The performance bond shall be valid for at least 20 years.

3109 MEASUREMETN FOR PAYMENT

3109.1 Reinforced soil Wall

The measurement for payment for reinforced soil wall shall be in square metres of finished work of each face and shall be measured in the plane of final inclination specified in the drawings. The measurement of length shall be the finished work along the length of the road. The measurement of height along the slope shall be done from the top level of the footing on which the facia element is placed to the top capping beam.

Measurement for friction slab and crash barrier shall be in liner meters.

3109.2 Reinforced Soil slope

The measurement for payment for reinforced soil slope shall be in square meters of finished work of each face and shall be measured in the plane of final inclination specified in the drawings. The measurement of length shall be the finished work along the length of the road. The measurement of height along the slope shall be done from the top of the leveling pad, where provided, to the top of the embankment. Where leveling pad is not provided, the bottom of the slope face.

3110 RATES

The rate shall include cost of material, labour, plant, royalties, handling storage and transportation expenses, cost of bed block, leveling pad, facia elements, capping beam, connectors, reinforcing elements, scaffolding, supply of the specified filter media material, supply of soil fill for the reinforced as well as unreinforced zone of the quality specified in the contract, placing spreading and compaction through mechanical means.

The rate shall include full compensation for design, drawing and testing of materials.

The rate shall include the cost of investigations. Design and construction of ground improvement measures.

The payment for friction slab and crash barrier shall be made separately.

ANNEXURE TO SECTION 3100

A1 DESIGN AND DRAWINGS

A1-1.1 Where the contract provides for the design of reinforced soil structures, the same shall be carried out in accordance with the following standards as applicable

1.1.1 BS:8006-1-2010 “Code of Practice for Strengthened/Reinforced Soils and other Fills”

1.1.2 AFNOR NF-P94-274- “Geotechnical Design – Retaining Structures-Reinforced and Soil Nailing Structures”.

1.1.3 FHWA-NHI-10-024 and FHWA-NHI-10-025- “Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes”

A1-1.2 The long term allowable design strength *(T_{al})* of the geosynthetic reinforcement is defined by the following relationship

$$T_{al} = \frac{T_{ult}}{RF_{CR} \times RF_{ID} \times RF_{W} \times RF_{CH} \times f_s}$$

Signature of tenderer (s)
with seal

RITES Bhawan
प्लाट नं.-1/Plot No.1
सैक्टर-29/Sector-29
122001 I/GURGAON-122001

Where,

T_{ult} *is the ultimate tensile strength (also called characteristic or short term strength)*

RF_{CR} - Reduction factor for creep

RF_{ID} - Reduction factor for installation damage

RF_{W} - Reduction factor for weathering

RF_{CH} - Reduction factor for chemical/environmental effects

f_s - Factor for the extrapolation of data

The cumulative reduction factor obtained as $RF_{CH} \times RF_{W}$ is also referred to as reduction factor for durability.

The value of RF_{CR} x RF_{CH} corresponding to the Average Annual Daily Temperature (AADT)/design temperature of the project area shall be used in the design.

The stresses calculated for any reinforcement layer as per the design method adopted shall be compared with the long term allowable design strength (T_{al}) to check for adequacy. Connection strength and Pullout safety shall also be checked.

A1-1.3 The design shall conform to loading of IRC:6 or as per contract. Earthquake loadings shall be considered as per IS:1893-Part 1-2002. Checks shall be made for seismic conditions also as per provisions of documents listed in 1.1.2 or 1.1.3 as applicable.

A1-1.4 The allowable bearing capacity of the ground shall be checked as a part of the design process and for ensuring the safety of the structure. Where necessary, measures to improve the bearing capacity shall be worked out and included in the design, based on adequate subsurface investigation and testing.

The design for ground improvement shall be in accordance with the relevant IS/IRC guidelines.

A1-1.5 Where modular block walls are used in zones with seismic intensity of greater than zone 3, connection strength shall be reduced to 80% of its static values as per FHWA NHI-10-024 guidelines Clause No. 4.4.8.a. Further, the blocs above the uppermost layer of soil reinforcement must be secured against toppling under all seismic events.

A1-1.6 **Crash Barrier**: Horizontal impact load of 29 kN/m shall be considered in the design of crash barrier; which load shall be resisted by the upper two layers of the reinforcement over the full length.

A1-1.7 Where the height of reinforced soil wall exceeds 10 m, the designer may consider providing a berm. The minimum width of such berm shall be 1.5 m.

A1-1.8 Drawing showing layout of the reinforcing elements in the cross section shall be provided for every 1 m change of height or such height where change in the layout of reinforcements occurs. Complete plan and profile drawings shall also be provided.

A1-1.9 Design and drawings shall be submitted for approval of the Engineer at least 3 weeks before the proposed date of commencement of construction of the reinforced soil wall/structure.

Table A1: Indicative Range of Reduction Factor Values

Polymer Type	RF_{CR}	RF_{ID}	RF_{CH} RF_W = R_D	f_s
PET	1.36-1.59	1-1.31	1-1.3	1-1.37
PVA	1.42	1.06-1.31	1-1.3	1-1.37
HIDPE	2.59.2.63	1.02-1.12	1-1.3	1-1.37

Note:

1. These values are the indicative range for different reduction factor for geogrids made by using different types of materials and various manufacturers. The value of reduction factors may differ from product to product. **However, actual certified values shall be used in the design**.
2. RF_{CR} and RF_{CH} value mentioned in the above table are for 20°C.

A2 SPACING AND LAYOUT OF REINFORCEMENT IN REINFORCED SOIL WALLS

A2-1.1 The spacing of reinforcement shall be established based on the design principles and standards as per provisions of Clause A1. However, in the actual layout of reinforcing elements, the following shall be adhered to as provided in the guidelines of FHWA NHI-10-025.

i) To provide a coherent reinforced soil mass, the vertical spacing of primary reinforcement shall not exceed 800 mm, in all types of reinforcement.

ii) For walls constructed with modular blocks and deriving their connection capacity by friction, and also for any other facia configurations, where connection capacity is by friction, the maximum vertical spacing of

reinforcement shall be two times the block width (measured from front fact to back face of the block). Further, the maximum spacing of reinforcing elements shall not exceed 800 mm in all cases.

The maximum height of facing left unreinforced a) above the uppermost reinforcing layer and b) below the lowest reinforcing layer, shall not exceed the width of the block (measured from the front face to tack face of the block.)

iii) In case modular blocks are used for facia, no more than one intervening block shall be left without having primary reinforcement.

iv) In case of wraparound facing for walls, the maximum spacing of reinforcing elements shall not exceed 500 mm, to protect against bulging.

v) Where panels are used, the maximum spacing of reinforcement shall not exceed 800 mm. The spacing of nearest reinforcing element shall be such that maximum height of facing above uppermost reinforcement layer and below the lower most reinforcement layer does not exceed 400 mm.

vi) Reinforcement spacings worked out from the design procedures shall be configured to fit the above parameters.

A2-1.2 Whereas the role of the primary reinforcement is to carry the tensile forces in the reinforced fill, secondary reinforcement may be required to protect the slope face from local sloughing and instability depending upon the facia configuration adopted. Where secondary reinforcement is used, stability of the area near the slope face shall be checked separately.

Where metallic type facia elements are used, the lower part of the facia element may be extended into the fill to serve as a secondary reinforcement. In other types of facia, geogrids may also be used as a secondary reinforcement. The length of the secondary reinforcement shall be adequate to provide local stability in the vicinity of the slope face.

A3 REINFORCEMENT SOIL SLOPES

A3-1.1 Reinforced Soil Slopes

Reinforced soil slopes are used in a wide verity of situations, such as

a) Construction of new embankments
b) Widening of existing slopes
c) To construct a reinforced slope above a reinforced soil wall

Reinforced slopes with face angle between 70° and 45° are classified as steep slopes and those with face angle flatter than or equal to 45° are classified as shallow slopes.

Design: The design and spacing of reinforcement shall be established based on the design principles of Clause A1 and per the provisions in standards BS:8006-1-2010, FHWA-NHI-10-024 and FHWA-NHI-10-025. The design is mainly based on rotational stability analysis.

Steep slopes require a suitable facing to hold the reinforcement in-place as well as to protect the slope from local instability adjacent to the face. In the case of flatter slopes also, facing may be called for. Depending upon the properties of the fill and local climatic conditions, of the area, suitable slope protection measures need to be adopted.

Where wrap around facia, gabion facia, woven and welded wire mesh facia are used suitable batter needs to be given. This batter may also be achieved by means of providing stepped offsets in placing the facia elements.

A3-1.2 Facia

Facing shall enable the construction within specified tolerances of vertical and horizontal alignment and it should perform over the design life. The facing system should be able to meet the functional requirements such as rigidity, flexibility, aesthetics, environmental considerations etc. depending on location, purpose and use of structure.

For reinforced soil slopes of permanent nature, the durability of basic material for facing shall be ensured. A suitable filter should be provided behind the woven or welded steel wire mesh elements when they are provided in wrap around form. For steeper slopes in high rainfall intensity and/or high seismicity areas, combination of woven and welded steel wire mesh elements with additional stiffening elements and filter cloth shall be used to achieve flexibility, erosion prevention and stiffness requirements.

Where Geosynthetics are used as facing for permanent reinforced slope structures, outer facia elements are required to be protected against UV degradation from sunlight. When vegetation is used as the facia cover, the face should provide a suitable medium like coir or jute for the establishment and continued growth of vegetation. For a vegetated face, several interrelated aspects need to be considered, including the climate, water requirements of plants and water availability, site location aspect, altitude, amount and frequency of precipitation, exposure, form of facing and erosion resistance capability to ensure permanent vegetative covering throughout the design life. If the characteristics of back fill soil are not adequate to support vegetation, suitable top soil material may be placed at the front face separated from the fill by an appropriate separator.

The contractor shall provide facing for the reinforced soil slope as approved by the designer and shown in the drawing plan.

ANNEXURE TO SECTION 3100

LIST OF CODES USED IN THE TEXT

S.No	Code	Description
1)	BS:8006-1:2010	Code of practice for strengthened/reinforced soils and other fills
2)	FHWA-NHI-10-024-Vol I & Vol II	Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes
3)	AFNOR NF-P94-270	Geotechnical Design-"Retaining structures-Reinforced and Soil nailing structures"
4)	IS:1893-Part 1:2002	Criteria for Earthquake resistant design of structures-Part 1: General provisions and buildings
5)	IS:13360:Part 3	Plastics – Methods of Testing – Part 3 : Physical and Dimensional Properties – Section 1
6)	IS:280	Specification for Mild steel wire for general engineering purposes
7)	IS:2720 (Part 8)	Determination of water content-dry density relation using heavy compaction
8)	IS:2720 (Part 13)	Methods of test for soils part 13: Direct Shear Test
9)	IS:2720: Part 39: Section 1	Direct shear test for soils containing gravel, Section 1 Laboratory test
10)	IS:13326-Part 1	Method of test for the evaluation of interface friction between Geosynthetics and soil: Part 1 modified direct shear technique for all types of geogrids
11)	IRC:6	Standard Specifications and code of practice for road bridges
12)	IRC:SP:85-2001	Guidelines on Use of Flyash in Road Embankments
13)	ASTM 974	Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses (Metallic-Coated or Poly (Vinyl Chloride) (PVC) Coating)
14)	ASTM 975	Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire With Poly (Vinyl Chloride) (PVC) Coating)
15)	ASTM D 6706	Standard Test Method for Measuring Geosynthetic Pullout Resistance in soil
16)	ASTM D 6638	Standard Test Method for Determining Connection Strength Between Geosynthetics Reinforcement

		and Segmental Concrete Unit (Modular Concrete Block)
17)	ASTM D 5321	Standard Test Method for Determining the Coefficient of Soil and Geosynthetic of Geosynthetic and Geosynthetic Friction by the Direct Shear method
18)	EN 10218	Steel Wire and Wire products- General Part 2- ire Dimensions and Tolerances
19)	EN 10223	Steel Wire and Wire Products for Fences- Hexagonal Steel Wire Netting for Engineering Purposes
20)	EN 10244	Steel and Wire Products- No Ferrous Metallic Coating on Steel Wire
21)	EN 10245	Steel and Wire Products – Organic Coatings on Steel Wire
22)	EN 10079	Definition of Steel Products
23)	EN 10080	Steel for the Reinforcement of concrete – Weldable Reinforcing Steel – General
24)	EN 1461	Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles- Specifications and Test Methods
25)	EN 10025-2	Hot Rolled Products of Structural Steels – Part 2- Technical Delivery Conditions for Non-Alloy Structural Steels
26)	EN-14475	Execution of Special Geotechnical Works- Reinforced Fill
27)	BS:1470	Specification for Wrought Aluminum and Aluminum Alloys for General Engineering Purposes
28)	BS:2870	Specification for Rolled Copper and Copper Alloys: Sheet, Strip and Foil
29)	ISO-10319	Geosynthetics – Wide-Width Tensile Test
30)	ISO/TR 20432	Guide to the Determination of Long-Term Strength of Geosynthetics for Soil Reinforcement
31)	ASTM D 4327	Standard Test Method for Anions in Water by Chemically Suppressed Ion Chromatography
32)	AASHTO T-288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
33)	AASHTO T-289	Standard Method of Test for Determining pH of Soil for Use in Corrosion Testing

ADDITIONAL TECHNICAL SPECIFICATION

PART - III

ADDITIONAL TECHNICAL SPECIFICATIONS

3.1 STUD SHEAR CONNECTOR

3.1.1 Material: -

The stud shear connector and ceramic ferrules shall conform to type SD1/UF as per BS EN ISO 13918-2008. The diameter of ceramic ferrule D 7 as per Figure 13/Table 18 of BS EN ISO 13918 shall be 26. Mechanical properties of stud shear connectors shall be as per ISO 6892/BS EN ISO 13918–2008. Shape of tip of stud shear connectors may be chosen by manufacturer. The stud tip shall be supplied with flux in the form of press fitted aluminium ball or Aluminium spray coating

3.1.2 Welding: -

The welding of stud shear connectors shall be done by "Drawn arc stud welding with ceramic ferrule" Technique. The stud and the surface to which studs are welded shall be free from scale, moisture, rust and other foreign material. The stud base shall not be painted, galvanized or cadmium plated prior to welding. Welding shall not be carried out when temperature is below 10 degrees Celsius or surface is wet or during periods of strong winds unless the work and the welder are adequately protected. The welds shall be visually free from cracks and shall be capable of developing at least the nominal ultimate strength of studs. The procedural trial for welding the stud shall be carried out when specified by the Engineer

3.1.3 Testing: -

(a) Appearance test:

1. The weld to a stud shear connector should form a complete collar around the shank and free from cracks, excessive splashes of weld material, free from injurious laps fins, seams, twist, bends or other injurious defects.

2. Weld material should have a `Steel Blue' appearance.

(b) Test to check the fixing of shear studs

All studs need to be checked by a ring test.

1. Ring Test: Involves striking the side of the head of the stud with a 2 kg hammer. A Ringing tone achieved after striking indicates good fusion whereas dull tone indicates a lack of fusion (BS 5400 – 6).

2. Bend Test: Test requires the head of a stud to be displaced laterally by approximate 25% of its height using a 6 kg hammer.

- The weld should then be checked for signs of cracking or lack of fusion

- Stud should not be bent back as this is likely to damage the weld.

- The testing rate should be 1 in 50 (BG 5400 – 6).

3.1.4 Deleted.

3.1.5 Deleted.

3.2 Load Testing of Bridge

3.2.1 General

These guidelines cover testing of superstructures, excluding arches for evaluation of their flexural capacity. Testing for shear capacity is not considered. This test is not intended to assess ultimate load carrying capacity of bridge superstructure.

3.2.2 Test Procedures – Method of Loading

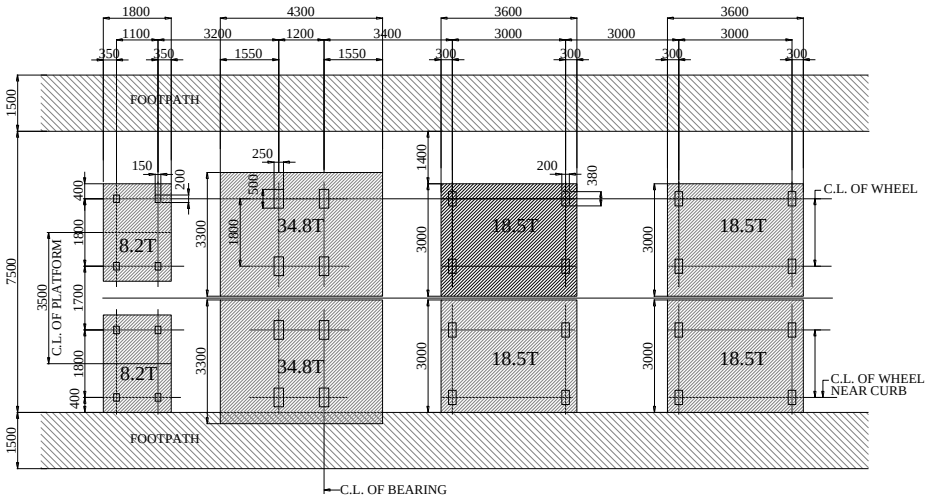
The method of loading should be such as to either simulate the specific class of vehicle or induce in the member(s) the calculated forces, viz., the bending moments at critical sections.

The test loads may be in the form of static loads on wheel/ track imprints of the specific class of vehicle.

3.2.3 Static Loads

3.2.4 Simulation of the specific IRC vehicle

The load effect on a span can be produced by building up pre weighed units on loading imprints spaced as per codal provisions. The imprints are built either with brick masonry or concrete and rolled steel sections placed across pairs of imprints, so that platforms could be built on a group of four imprints for placement of pre weighed units. The area of each platform depends on the magnitude of the load and unit weight of individual unit. A pre weighed unit normally comprises sand or soil filled gunny bags, concrete cubes, bricks etc., which can be carried manually. Otherwise, large concrete blocks, containers of water or (stone) ballast or steel ingots could be used if mechanical handling facilities are available to load and unload them from test vehicles. Fig. below shows a scheme for building up 2 lanes of IRC Class A loading on the carriageway of a bridge. The loads are placed eccentrically on the carriageway of a bridge in such a way that maximum bending moment is produced in any longitudinal.



PLACEMENT OF 2-LANES OF IRC CLASS-A LOADING AND FOOT6PATH LOADING ON CARRIAGEWAY

3.2.5 Other types of static loads

Any configuration which produces the design forces (load effects) in the member(s) could be adopted, for instance uniformly distributed load. Any of the appropriate methods of load distribution between the girders can be adopted in arriving at the test load and its configuration on the span. But the method of distribution of loads should be the same as adopted in the approved design. However, where the approved designs are not available the owner of the bridge should specify the appropriate method of load distribution. In the case of multiple girders, it is possible that the design moments are simultaneously induced in more than one girder. It may well happen that the magnitude of the test load on the span is greater than that of the design IRC vehicle but the forces induced in any member should be always equal to the specified design force of the load test.

3.2.6 Loading and Unloading Sequence

3.2.6.1 The test load shall be applied in stages so that timely action, such as stopping the test, can be taken if any untoward distress is observed at any stage. In most cases, the design live load effect would be equal to or less than that due to dead load. The dead load is already acting the test load it some specified multiple of live load more than one. The suggested stages of test load placement are 30 percent, 50 percent, 70 percent, 80 percent, 90 percent and 100 percent. Unloading should also be in the same stages. The next incremental loading should be added only after the deflections under the previous load have stabilized and all the stipulated observations are completed.

3.2.6.2 The selection of first stage of loading depends on the general condition of a bridge and the load carrying capacity theoretically assessed. It is advisable to monitor the appearance and widening of flexural cracks at every stage of loading, so as to decide about placement of next incremental load. It is expected that the load deflection characteristics at every increment are linear and any abnormal behaviour is reflected in the load v/s deflection data. It the deflection observed exceeds the limit prescribed in the code the further loading shall be stopped. Subsequent actions shall be taken in consultation with appropriate authorities. Occasionally, crackling sounds at the locations of expansion joints are heard when the rotation capacity is exceeded, particularly, in balanced cantilever bridges. Spalling of delaminated concrete is also possible during load tests.

3.2.7 Preparatory Work

- All visual defects should be measured, mapped and plotted.
- It should be ensured that bearings are functional.
- Expansion gaps, joints should be cleared of all debris.
- It will be useful to give the surface of the superstructure a coat of white wash, so that appearance of cracks becomes immediately perceptible.

3.2.8 Precautions

- Staging should be stable and safe.
- Staging for instruments and that for observers should be quite independent.
- Staging for instruments should be rigid.
- Due to temperature change, the superstructure may tend to hog or sag; therefore, it should be ensured that when this occurs, contact with the spindle of the dial gauge is not lost. Spindle extensions should be fixed to take care of this.

During the 24-hour retention period of built up load, care shall be taken to cover the pre weighed units with tarpaulin, so that rain or strong winds do not affect the stacking on the platforms.

3.2.9 Observations

The following should be observe, measured and recorded at regular intervals of one hour over a period of 24 hours:

- Deflections at critical sections (for instance for simply supported spans at mid-span and at quarter-span. In box girders, it will be useful to record deflections under each of the external ribs).

- Appearance of cracks and their development, length, width, location, orientation correlated with load.

- Deformation of bearings.

- Ambient temperature and related temperature in the body of the structure.

3.2.10 Measurement of deflections

Deflections could be measured with the following devices:

(a) Dial gauges

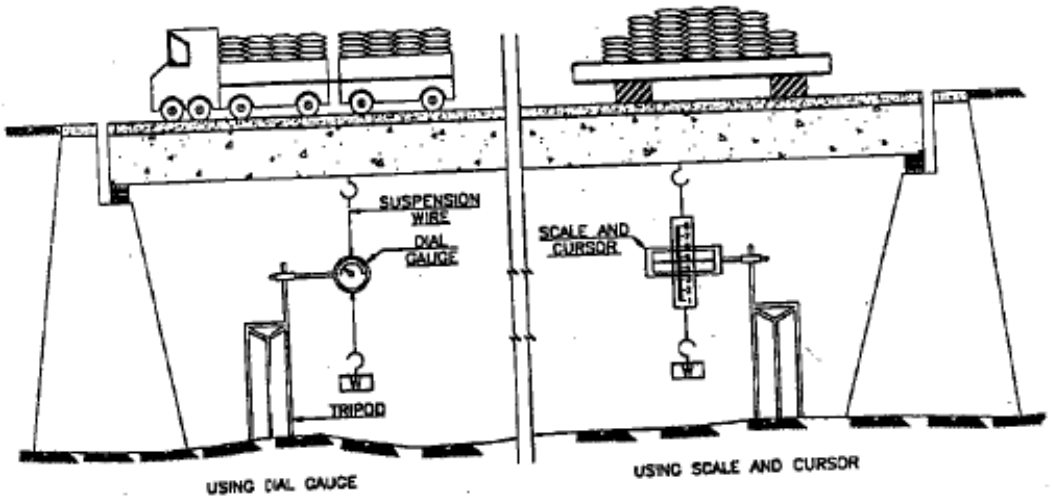
(b) Scale and cursor

(c) Deflectometers

(d) Precision level

(e) Water level

The methods (a) to (c) could be used wherever dry bed is available under the span. Otherwise, methods (d) and (e) can be used by using a reference station at the nearby abutment. When girder bridges are subjected to load tests, it is essential to clear debris in the expansion gaps and lubricate steel bearings to permit free translation and rotational movements of the spans.



The deflection measurement can be done by suspension wire method at the required locations using dial gauges (Fig.). In this method trestles or posts 1.5m tall would be embedded in firm ground and dial gauges of least count 0.01 mm are clamped to them. The spindles of the dial gauges are connected by a pair of adapters in plumb line with a GI or Invar wire. The wire is made taut by attaching a weight at the end. The method could be partly modified by using a (steel) scale and cursor instead of dial gauge, when the order of anticipated deflection exceeds 100mm. Fig. 2 also shown the scale and cursor method for measurement of large defections.

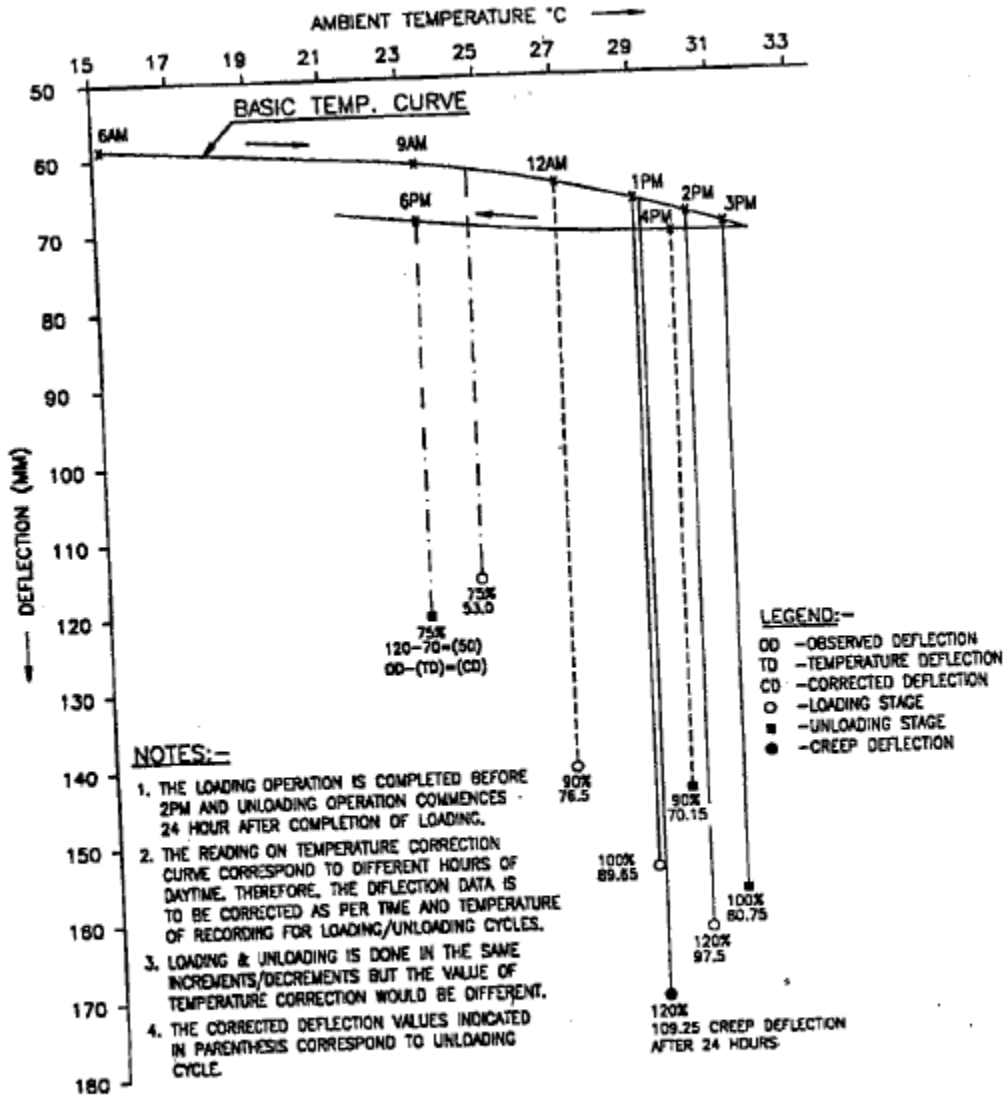
3.2.11 Procedure for Temperature Correction

A set of thermocouples are to be fixed at different locations of deflection measurement for monitoring temperature of the bridge deck. In absence of thermocouples, hand held instruments could be used wherein a probe could be inserted in a preformed hole in concrete surface, for recording temperature. As a last resort, thermometers could also be suspended from trestles used for deflection measurement to measure the shade temperature. The number of thermocouples/thermometers/probes used could be about half the total number of locations for deflection measurement.

The superstructure tends to hog or sag due to variation in ambient temperature and it is necessary to apply correction to the deflection data during static load test. This is so since the duration of loading or unloading operation in static load test could be for 4-5 hours.

For this purpose, the platforms on masonry imprints meant for building up static loads should be placed in respective positions for observing thermal response of the bridge deck prior to load test. The deflection values and ambient temperature data are generally collected from dawn to dusk for two or three consecutive days at 1 hour intervals. The temperature vs. deflection data are collected on these days

and a curve drawn for each station (dial gauge location), which is taken as basic curve for temperature correction. Usually the temperature – deflection characteristic would be a best fit obtained from a cluster of readings. The deflection reading at any location and temperature during load test, is super-imposed on the basic curve. The difference between the two values give the true deflection for the location under reference, corresponding to the same temperature. Fig. below shows typical characteristic of thermal response, super imposed on load vs. deflection data during a proof test.



Precaution

The bridge deck temperature gets affected due to variation in humidity and strong winds on the day. Also, the data gathered on sunny and cloudy days would be different, although the ambient temperature is same.

Therefore, to avoid inconsistencies in the data, it is preferable to choose two identical spans, one for load test and the other for temperature – deflection data and should be monitored simultaneously. This approach reduces the total period of load testing by at least two days.

3.2.12 Percentage Recovery of Deflection

The percentage recovery could be calculated for values of deflection. The percentage recovery is calculated at 24 hours after removal of load.

The calculation is done as follows after effecting temperature and/or rotation correction to deflection data:

Initial value (on dial gauge) … R1

Final value after placement of test load … R2

[Thereafter, measurements are to be taken at regular intervals of one hour].

Value at 24 hours after placement of test load ... R3

Value immediately after removal of test load … R4

[Thereafter, measurement is to be taken at regular intervals of one hour]

Value at 24 hours after removal of test load R5

Total deflection … R3-R1

Total recovery 24 hrs. after removal of test load R3-R5

Percentage of recovery of deflection … $\frac{(R3-R5) \times 100}{(R3-R1)}$

24 hrs. after removal of test load

3.2.13 Acceptance Criteria

3.2.13.1 The criterion of acceptance is based on recovery of deflection after removal of test load. It is necessary to specify the quantum of applied load, the duration of the load on the span and the percentage recovery of deflection on removal of load.

3.2.13.2 For bridges designed for IRC Standard loadings, criteria for load testing of steel, PSC and RCC superstructures are given in table below:

Table Acceptance Criteria

Sl. No.	Type of Bridges	Live Load Intensity for Testing	Duration of Retention of Test Load (Hrs.)	Minimum percentage recovery of Deflection at 24 hrs after removal of Test Load
1	Reinforced concrete	*	24	75
2	Prestressed concrete	*	24	85
3	Steel	*	24	85
4	Composite	*	24	75

(* 1.0L plus corresponding impact as per IRC Codes)

A general acceptance criterion for the behavior of a structure under test load is that it shall not show "visible evidence of failure" which include appearance of cracks of width more than 0.3mm, spalling or deflections which are excessive and incompatible with safety requirements.

3.3 NON-DESTRUCTIVE INTEGRITY TESTING OF PILE

3.3.1 SCOPE

This specification covers the methods on non-destructive testing as per IS: 14893 of all types of concrete piles covered in IS 2911 (Part I/Sections 1, 2, 3 and 4).

3.3.2 SITE INFORMATION REQUIRED FOR THE TESTS

The following information is generally required to carry out integrity tests:

(a) Location of site.

(b) Pile types including size, material and reinforcement.

(c) Layout of piles.

(d) Details of pile installation (including construction and driving sequence and rest periods).

(e) Number of piles to be tested;

(f) Subsurface profile/driving details of the piles (More if variations are noted)

(g) Depth of water table and soil investigation report, if any.

(h) Density of concrete; Strength of concrete.

(i) Abnormal conditions noted while driving/boring or concreting of piles. The normal daily report produced by the piling site should contain this information. In addition, any other information concerning planning and conducting the tests including relevant past experiences covering similar test(s) in the area, and,

(j) Details of test piles(s), if any.

3.3.3 TYPES OF TESTS

Various methods are available for checking the integrity of concrete piles after installation. In the most widely used method, impulses or vibrations are applied to the pile and measurements made of timings and attenuation of reflected signals.

The commonly used sonic methods, vibration methods, sonic logging techniques, etc, have been tried within the last 15-20 years in different parts of the world. However, the methods based on One Dimensional Stress Wave approach known as Sonic Integrity Testing, a Low Strain Integrity testing or Sonic Echo Testing have been used successfully in various parts of the world. The method is simple and quick enabling dozens of piles to be examined in a single working day without much interference in site activities.

The work carried out on sonic integrity testing of pile in the country has shown its efficiency; in assessing the structural quality of piles and therefore it is appropriate to frame in this code the salient features of this method.

3.3.3.1 The Low Strain Integrity Testing

This is a system of assessing the integrity of piles by the use of low stress wave imparted to the pile shaft and is also known as Sonic Integrity or Sonic Echo Test. A small metal/hard rubber hammer is used to produce a light tap on top of the pile. The shock travelling down the length of the pile is reflected back from the toe of the pile and recorded through a suitable transducer/accelerometer (also held on top of the pile close to the point of impact) in a computer disk or diskette for subsequent analysis.

The primary shock wave which travels down the length of the shaft is reflected from the toe by the change in density between the concrete and sub-strata. However, if the pile has any imperfections or discontinuities within its length these will set up secondary reflections which will be added to the return signal. *(See* Fig.).

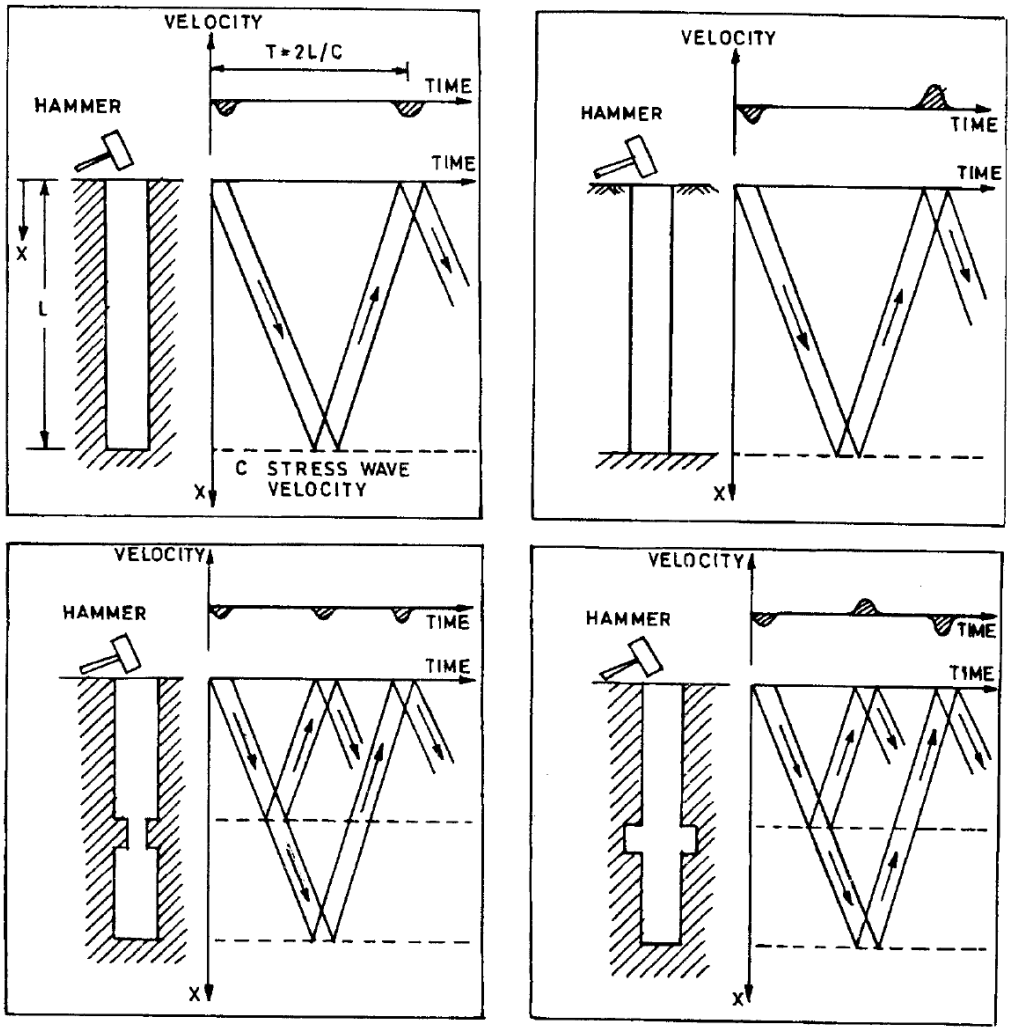
By a careful analysis of the captured signal and knowledge of the conditions of the ground, age of concrete, etc., a picture of the locations of such problems can be built up. The reflected stress wave can be monitored using either processing technique; the observed signals are amplified and converted into digital display as velocity versus length or frequency versus mobility records, providing information on structural integrity of piles.

The stress wave velocity and approximate pile lengths are provided as input for the integrity testing. The stress wave velocity is dependent on the Young's modulus and mass density of pile concrete. This value generally lies between 3000-4000 meter per second depending on the grade of concrete used (M15-M25).

3.3.3.2 Normally more than one recording of signals is done until repeatability of signals is achieved. If necessary, averaging of signals is also done to achieve more informative signals. In a suspected pile the test should be repeated at more than one location on top of the pile.

3.3.3.3 The tests shall be conducted on piles whose length is correctly recorded or on test piles where available, to determine the value of stress wave velocity and characteristic or reference signal for comparing the signals for testing subsequent piles.

3.3.3.4 The method of testing involves high skill and use of computerized equipment. Therefore, the tests should be performed and interpreted by trained and experienced personnel.



3.3.4 Data and Reporting

(i) The assessment of structural integrity is based on two equally important aspects:

a) Quality of signals, and

b) Accurate analysis and interpretation of signal.

(ii) Piles requiring remedial measures should be so marked immediately on completion of the field integrity testing, and rectification, measures selected.

(iii) The final report should include signals of each integrity test and reflect on the structural condition of piles.

3.3.5 GENERAL REQUIREMENTS OF THE TESTS

(i) Piles shall be trimmed to cut off level or sound concrete level before the test with all laitance removed. No pile cap blindage work should be undertaken prior to the test.

(ii) The area surrounding the pile should be free from standing water and kept dewatered during the tests.

(iii) The pile head should be accessible.

(iv) Testing should be free of work likely to cause disturbance.

(v) The cast-in-situ piles should not be tested normally before 14 days of casting.

(vi) The test piles, if available at site, can be used to determine the pulse velocity and characteristic or reference signal generated. Where no test pile is available information can be obtained from cast piles whose length is accurately recorded.

3.3.6 LIMITATIONS OF NDT METHODS

(i) Non-Destructive Testing of piles does not provide the load carrying capacity of piles.

(ii) It does not provide information regarding verticality or displacement in position of piles.

(iii) Minor deficiencies like local loss of cover, small intrusions or type of conditions of materials at the base of piles are undetectable. Integrity testing may not identify all imperfections, but it can be useful tool in identifying major defects within the effective lengths. The test may identify minor impedance variations that may not affect the bearing capacity of piles. In such cases, the engineer should use judgment as to the acceptability of these piles considering other factors such as load redistribution to adjacent pile, load transfer to the soil above the defect, applied safety factors and structural load requirements.

(iv) Based on the latest information available, the limitations relating to the depths up to which the integrity tests can be carried on piles depends on the surrounding strata and damping within the concrete.

(v) The present experience of Non-Destructive Testing of piles is up to a diameter of 1500 mm.

(vi) Soil stiffness or founding on rock of similar density as the pile will attenuate the signals such that there will be little or no toe reflection.

(vii) The low strain integrity method is applicable to cast – in – situ concrete bored and driven piles. Conclusive results are rarely obtained in case of segmented precast reinforced concrete driven piles or precast piles in pre bored holes.

3.3.7 METHOD OF MEASUREMENTS: It will be measured in number.

3.3.8 PAYMENTS: The rate includes cost of all materials, labour, equipments & operations required to do this test.

MILESTONES AND TIME SCHEDULE

PART-IV

CHAPTER - I

MILESTONES AND TIME SCHEDULE

4.1.1 Time Schedule:

4.1.1.1 Time of start and completion:

The time allowed for execution of the works is 18 months (Eighteen months) from the date of issue of letter of acceptance from DFCCIL.

The contractor shall be expected to mobilize to the site of works and commence execution of the works within 15(days) from issue of Acceptance Letter by DFCCIL.

The contractor shall be expected to complete the whole work ordered on the contractor within 18 months (Eighteen months) from the date of issue of Acceptance Letter by DFCCIL.

If the contractor commits defaults in commencing execution of the works as afore stated, DFCCIL shall without prejudice to any other right to remedy, be at liberty to forfeit fully the Earnest Money Deposit and performance guarantee of the contractor.

4.1.1.2 Progress of works:

The contractor shall submit a programme of work in the form of a Bar Chart of all the activities in consistence with milestone target envisaged below. In case this bar chart requires to be modified, the Engineer and the contractor shall agree upon a time and progress chart. The chart shall be prepared in direct relation to the time stated as 18 months for the completion of the works as the milestone targets specified below of these special conditions. It shall indicate the forecast of the dates of commencement and completion of various activities of the work and may be amended as necessary by agreements between the Engineer and the contractor within the limitation of 18 months as overall completion period.

4.1.2 Achievement of milestone progress:

In order to ensure progress during the execution of the work the contractor will be expected to achieve the following milestone targets ahead of dates mentioned against each. Failure to achieve accomplished milestone targets within allocated timeframe, save for reason accepted as laid by the Engineer shall create and constitute the ground for failure on the part of contractor for maintaining progress of the work as per agreed programme.

Milestone Targets	Time allocated within which to achieve completion in total 18 (Eighteen) months' Time
(a) Physical commencement of work	D + 20 days
(b) Mobilization of equipments	D + 30 days
(c) Full mobilization of plant, machinery, men and material	D + 40 days
(d) Construction of foundation (Railway portion)	D+ 150 days
(e) Construction of substructure (Abutments &Piers) (Railway portion)	D + 120 to D+300 days
(f) Fabrication and launching of steel superstructure (Railway portion)	D + 60 to D + 450 days
(g) Construction of deck slab including foot path, crash barrier, railing, Staircases etc. (Railway portion)	D + 250 to D + 500 days
(h) Completion of providing & fixing of protection screens, cables, testing, etc. final Finishing and clearance/tidying up of site completely (Railway portion)	D + 400 to D + 540 days
(i) Completion of foundation (for approaches)	D + 180 to D + 365 days
(j) Completion of substructure (Abutments, Piers & Pier caps etc) (for approaches)	D + 280 to D + 400 days
(k) Completion of Superstructure (for approaches)	D + 340 to D + 500 days
(l) Completion of RE wall & approaches (for approaches)	D + 200 to D + 500 days
(m) Completion of road diversions, signage, kerbs etc. (for approaches)	D + 450 to D + 520 days
(n) Testing, final finishing and clearance/tidying up of site completely (for approaches)	D + 490 to D + 540 days

Note: "D" is the date of issue of Letter of Acceptance by DFCCIL to the contactor.

TENDER FORMS (INCLUDING SCHEDULE OF PRICES)

PART- IV

CHAPTER - II

TENDER FORMS

FORM No.	SUBJECT
Form No. 1	Offer Letter
Form No. 2	Tenderer's Credentials
Form No. 2A	Technical Eligibility Criteria Details
Form No. 2B	Financial Eligibility Criteria Details
Form No. 2C	Applicant's Party Information Form
Form No. 3	Summary of Prices
Form No. 4	Schedule of Prices and Total Prices
Form No. 5	Contract Agreement
Form No. 6	Performance Guarantee Bond
Form No. 7	Standing indemnity bond for on account payment.
Form No. 8	ECS / NEFT / RTGS
Form No. 9	Draft MOU for Joint Venture Participation
Form No. 10	Draft Agreement for JV
Form No. 11	Pro-forma of Participation from each partner of JV
Form No. 12	Power of Attorney for authorized signatory of JV Partners
Form No. 13	Power of Attorney to lead partner of JV
Form No. 14	Proforma for Time Extension
Form No. 15	Certificate of Fitness
Form No. 16	Proforma of 7 days Notice
Form No. 17	Proforma of 48 Hours Notice
Form No. 18	Proforma of Termination Notice
Form No. 19	Format of Bank Guarantee for Mobilisation
Form No. 20	Format of Integrity pact
Form No. 21	Format of affidavit

FORM No. 1

OFFER LETTER

Tender No. **MTC-EN-LC43-EDFC-ROB**

Name of work - Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor.

To,
The General Manager/Co
DFCCIL,

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda.;

(b) We offer to execute the Works in conformity with the Bidding Documents;

(c) Our bid shall be valid for a period of 120 days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(d) We have not been blacklisted/banned in accordance with para.1.3.13 (ii)(v)(a) of Preamble and General Instructions to tenderers.

(e) We are neither Bankrupt/Insolvent nor in the process of winding-up nor there is a case pending before any Court on deadline of submission of the Bid in accordance with para. 1.3.13 (ii) (v) (b) of Preamble and General Instructions to tenderers.

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

(g) If our bid is accepted, we commit to deploy key equipment and key personnel consistent with the requirements of the work.

(h) We understand that this bid, together with your written acceptance thereof included in your notification of award/Letter of Acceptance (LOA), shall constitute a binding contract between us, until a formal contract is prepared and executed; and

(i) All information, statements and description in this bid are in all respect true, correct and complete to the best of our knowledge and belief and we have not made any tampering or changes in the bidding documents on which the bid is being submitted and if any tampering or changes/incorrect information are detected at any stage, we understand the bid will invite summarily rejection and forfeiture of bid security, the contract will be liable to be terminated along with forfeiture of performance security, even if LOA has been issued.

(j) We understand that you are not bound to accept the lowest bid or any other bid that you may receive.

Name .....

In the capacity of .....

Signed .....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

FORM No. 2

TENDERER'S CREDENTIALS

S. No	Description
1.	For technical experience/competence, give details of similar completed works during the last three financial years (i.e. current Financial year and three previous Financial Years) in the Proforma given in Form-2A
2.	For financial capacity and organizational resources, give details of contractual payments received for the last three financial years (i.e current Financial year and three previous financial years) as per audited balance sheet certified by Chartered Accountant in the Proforma given in Form-2B
3.	Give constitution of your firm. Attach certified copies of legal documents in support thereof. Form-2C

FORM No. 2A

TECHNICAL ELIGIBILITY CRITERIA DETAILS

Details of the similar works completed (as per Para 1.3.13 (i) of Preamble and General Instructions to Tenderers)

Similar Contract No.		
Contract Identification		
Award date		
Completion date		
Role in Contract	Prime Contractor ☐	Member in JV ☐
Total Contract Amount (Rs.)		
If member in a JV , specify participation in total Contract amount	*[insert a percentage amount]*	*Total contract amount in Rs.*
Employer's Name: Address: Telephone/fax number E-mail:		
Description of the similarity in accordance with Criteria 1.3.13(i)(A)		

The bidder shall attach Certified completion certificates issued by the client duly attested by Notary as per Eligibility Criteria of the tender documents.

Signature of the
Tenderer with Seal

FORM No. 2B

FINANCIAL ELIGIBILITY CRITERIA DETAILS

Each Bidder or each member of JV must fill in this form separately.
Name of Bidder/JV Partner

Details of contractual payments received during the last three financial years and current financial year

Contractual payments received	
Year	Value of payment received in Rs. (Contract Receipts)
Current Year (2020-2021)	
2019 – 2020	
2018 – 2019	
2017 – 2018	
Total Contractual Payment received	

Note: The details should be extracted from the audited balance sheet Certified by the Chartered Accountant or form 16-A issued by the Employer as per clause 1.3.13 of Preamble and General Instructions to Tenderers.

The bidder shall attach necessary documents in support of the above.

Signature of the
Tenderer with Seal

FORM No. 2C

APPLICANT'S PARTY INFORMATION FORM

Applicant name: *[insert full name]*
Applicant's Party name: *[insert full name of Applicant's Party]*
Applicant's Party country of registration: *[indicate country of registration]*
Applicant Party's year of constitution: *[indicate year of constitution]*
Applicant Party's legal address in country of constitution: *[insert street/ number/ town or city/ country]*
Applicant Party's authorized representative information Name: *[insert full name]* Address: *[insert street/ number/ town or city/ country]* Telephone/Fax numbers: *[insert telephone/fax numbers, including country and city codes]* E-mail address: *[indicate e-mail address]*
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above. ☐ In case of a Government-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and absence of dependent status. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Signature of the
Tenderer with Seal

FORM No. 3

SUMMARY OF PRICES

(Summary of Prices has been separately attached in Financial Packet "B")

FORM No. 4

SCHEDULE -1
SCHEDULE OF PRICES (Summary and Detailed)

(Schedule of Prices (Summary and Detailed) have been separately attached in Financial Packet "B").

FORM No. 5
SAMPLE

A G R E E M E N T

CONTRACT AGREEMENT

THIS AGREEMENT ("Agreement") is made at New Delhi on the ___day of _
BETWEEN

(1) Dedicated Freight Corridor Corporation of India Limited, incorporated under the laws of India and having its principal place of business at, Pragati Maidan Metro Station Building Complex, New Delhi, India – 110001 (hereinafter called **'the Employer'**), and **----------,** a company / corporation / JV incorporated under the laws of ----------having its principal place of business at ---------- (hereinafter called "**the Contractor**").

WHEREAS in reference to a call for Tender for "Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor" as per Tender paper No. **MTC/EN/MTC-SRE-LXING/EDFC/ROB dated --.--.2020** at Annexure "A" here to, the Contractor has submitted a Tender hereto and whereas the said Tender of the contractor has been accepted for "Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor", as per copy of the Letter of Acceptance of Tender No-------- dated ----_complete with enclosure at the accepted rates and at an estimated contract value of Rs._____(Rupees _only). Now the agreement with witnessed to that in consideration of the premises and the payment to be made by the Employer to the Contractor provided for herein below the Contractor shall supply all equipments and materials and execute and perform all works for which the said Tender of the Contractor has been accepted, strictly according to the various provisions in Annexure 'A' and 'B' hereto and upon such supply, execution and performance to the satisfaction of the Purchaser, the Purchaser shall pay to the contractor at the several rates accepted as per the said Annexure 'B' and in terms of the provisions therein.

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

For and on behalf of the Contractor

Signature of the authorized official
Name of the official

Stamp/seal of the Contractor

For and on behalf of the Employer

Signature of the authorized official
Name of the official

Stamp/Seal of the Employer

SIGNED, SEALED AND DELIVERED

By the said _____Name

on behalf of the Contractor in the presence of:
Witness _____
Name _____
Address _____

By the said _____Name

on behalf of the Employer in the presence of:
Witness _____
Name _____
Address _____

Enclosures: -

1. Annexure 'A' - Tender Papers No.
2. Annexure 'B' - Letter of Acceptance of Tender No._____Dated_____ along with Summary of Prices

FORM No. 6

SAMPLE

Name of the Bank _____

Managing Director/ DFCCIL Bank Guarantee Bond No._____
Acting through ____(Designation Dated and address of contract signing authority)

PERFORMANCE GUARANTEE BOND

In consideration of the Managing Director/ DFCCIL acting through _____ (Designation & Address of Contract Signing Authority), Dedicated Freight Corridor Corporation of India Limited, New Delhi hereinafter called "DFCCIL") having agreed under the terms and conditions of agreement/Contract Acceptance letter No. _____ dated made between _____(Designation & address of contract signing Authority) and _____(hereinafter called "the said contractor(s)" for the work_____ (hereinafter called "the said agreement") having agreed for submission of a irrevocable Bank Guarantee Bond for Rs._____ (Rs. ____only) as a performance security Guarantee Bond from the contractor(s) for compliance of his obligations in accordance with the terms & conditions in the said agreement.

1. We _(indicate the name of the Bank) hereinafter referred to as the Bank, undertake to pay to the Government an amount not exceeding Rs. _____ (Rs. ____only) on demand by the Government.
2. We _____(indicate the name of the bank, further agree that (and promise) to pay the amounts due and payable under this guarantee without any demur merely on a demand from the Government through the GROUP GENERAL MANAGER/ FINANCE Dedicated Freight Corridor Corporation of India Limited, New Delhi or ___ (Designation & Address of contract signing authority) DFCCIL, stating that the amount claimed is due by way of loss or damage caused to or would be caused or suffered by the Government by reason of any breach by the said contractor of any of the terms or conditions contained in the said agreement or by reason of the contractor failure to perform the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rs. _____only)

3 (a) We, _____(indicate the name of Bank) further undertake to pay to the Government any money so demanded not withstanding any dispute or dispute raised by the contractor (s) in any suit or proceeding pending before any court or Tribunal relating to liability under this present being absolute and unequivocal.

(b) The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the contractor(s) shall have no claim against us for making such payment.

4. We, _ (indicate the name of bank) to further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged by _____(Designation & Address of contract signing authority) on behalf of the Government, certify that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor (s) and accordingly discharges this guarantee.

5. (a) Not withstanding anything to the contrary contained herein the liability of the bank under this guarantee will remain in force and effect until such time as this guarantee is discharged in writing by the Government or until (date of validity/extended validity) whichever is earlier and no claim shall be valid under this guarantee unless notice in writing thereof is given by the Government within validity / extended period of validity of guarantee from the date aforesaid.

(b) Provided always that we _____(indicate the name of the Bank) unconditionally undertakes to renew this guarantee to extend the period of guarantee form year to year before the expiry of the period or the extended period of the guarantee, as the case may be on being called upon to do so by the Government. If the guarantee is not renewed or the period extended on demand, we _____(indicate the name of the Bank) shall pay the Government the full amount guarantees on demand and without demur.

6. We, _ (indicate the name of Bank) further agree with the Government that the Government shall have the fullest liberty without our consent and without effecting in any manner out of obligations hereunder to vary any of the terms and conditions of the said contract from time to time or to postpone for any time or from time to time any to the powers exercisable by the Government against the said contractor (s) and to forbear or enforce any of the terms and conditions of the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor (s) or for any bearance act or omission on the part of the Government or any indulgence by the Government to the said contractor (s) or by any such matter or thing whatsoever which under the law relating to sureties for the said reservation would relive us from the liability.

7. This guarantee will not be discharged by any change in the constitution of the Bank or the Contractor (s).

8. We, _____(indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Government in writing.

9. This guarantee shall be valid upto _____(Date of expiry of defect liability period plus 60 days beyond that) unless extended on demand by Government.

Notwithstanding anything to the contrary contained herein before, our liability under this guarantee is restricted to Rs. _____ (Rs. _____only) unless a demand under this guarantee is made on us in writing on or before _____ we, shall be discharged from our liabilities under this guarantee thereafter.

Dated _____ the day of _____ for _____(indicate the name of bank)

Signature of Bank Authorize official
(Name):
Designation:
Full Address.

Witness:
1. _____

2. _____

FORM No. 7

SAMPLE
STANDING INDEMNITY BOND FOR "ON ACCOUNT" PAYMENTS

(On paper of requisite stamp value)

We, M/s _____hereby undertake that we hold at our stores Depot/s at _____for and on behalf of the Managing Director/ DFCCIL acting in the premises through the Chief General Manager / DFCCIL/Meerut or his successor (hereinafter referred to as "The Employer") all materials for which "On Account" payments have been made to us against the Contract for (_____) on the section _____DFCCIL also referred to as Group/s _____vide letter of Acceptance of Tender _____ ___dated _____ and material handed over to us by the employer for the purpose of execution of the said contract, until such time the materials are duly erected or otherwise handed over to him.

We shall be entirely responsible for the safe custody and protection of the said materials against all risk till they are duly delivered as erected equipment to the employer or as he may direct otherwise and shall indemnify the employer against any loss /damage or deterioration whatsoever in respect of the said material while in our possession and against disposal of surplus materials. The said materials shall at all times be open to inspection by any officer authorized by the Chief General Manager / DFCCIL/Meerut in charge of Dedicated Freight Corridor Corporation of India Limited (Whose address will be intimated in due course).

Should any loss, damage or deterioration of materials occur or surplus material disposed off and refund becomes due, the Employer shall be entitled to recover from us the 85% of supply portion of Part IV, Chapter – II (Form - 4) to the Contract (as applicable) and also compensation for such loss or damage if any long with the amount to be refunded without prejudice to any other remedies available to him by deduction from any sum due or any sum which at any time hereafter becomes due to us under the said or any other Contract.

Dated this day ___day of 2019
for and on behalf of
M/s _____(Contractor)
Signature of witness
Name of witness in Block letter.

Address.

FORM No. 8

ECS / NEFT / RTGS
MANDATE FORM

Date: -

To,

GM (F) / GGM (F)

DFCCIL, New Delhi.

Sub: ECS / NEFT / RTGS payments

We refer to the ECS / NEFT / RTGS set up by DFCCIL for remittance of our payments using RBI's NEFT / RTGS scheme, our payments may be made through the above scheme to our under noted account.

Name of Bank	
Name of City	
Bank Code No	
Name of Bank Branch	
Branch Code No	
Address of Bank Branch	
Telephone Number of Bank Branch	
Fax No of Bank Branch	
Name of customer / Tenderer as per account	
Account Number of Tenderer appearing on cheque book	
Type of Account (S. B. / Current / Cash credit)	
IFSC code for NEFT	
IFSC code for RTGS	
9-Digit-code number of the bank and branch appearing on the MICR cheque issued by the bank.	
Details of Cancelled Cheque leaf	
Telephone no of tenderer	
Cell Phone Number of the tenderer to whom details with regard to the status of bill submitted to	

Signature of tenderer (s)
with seal

राइट्स लिमिटेड/RITES LIMITED ★ राइट्स भवन RITES Bhawan प्लाट नं.-1/Plot No.1 सैक्टर-29/Sector-29 ★ गुड़गांव-122001/GURGAON-122001

Accounts Office i.e. Co6 & Co7 & Cheque Purchase Orders particulars can be intimated through SMS	
Tenderer's E - mail ID	

Confirmed by Bank signature of tenderer with stamp and address
Enclose a copy of crossed cheque

FORM No. 9

DRAFT MEMORANDUM OF UNDERSTANDING (MOU) For JOINT VENTURE PARTICIPATION BETWEEN

M/s ……. having its registered office at …… (hereinafter referred to as ……) acting as the Lead Partner of the first part,
and
M/s ……. having its registered office at ……. (hereinafter referred to as `…….') in the capacity of a Joint Partner of the other part.
and
M/s ……. having its registered office at ……. (hereinafter referred to as `…….') in the capacity of a Joint Partner of the other part.

The expressions of …….. and ……. shall wherever the context admit, mean and include their respective legal representatives, successors-in-interest and assigns and shall collectively be referred to as "the Parties" and individually as "the Party"

WHEREAS:
Dedicated Freight Corridor Corporation of India Limited (DFCCIL) [hereinafter referred to as "Client"] has invited bids for … "[Insert name of work] ……..."

NOW, THEREFORE, THE PARTIES AGREE AS FOLLOWS:

1. The following documents shall be deemed to form and be read and construed as an integral part of this MOU.
   (i) Notice for Bid, and
   (ii) Bidding document
   (iii) Any Addendum/Corrigendum issued by Dedicated Freight Corridor Corporation of India Limited
   (iv) The bid submitted on our behalf jointly by the Lead Partner.

2. The `Parties' have studied the documents and have agreed to participate in submitting a `bid' jointly.

3. M/s ……shall be the lead member of the JV for all intents and purpose and shall represent the Joint Venture in its dealing with the Client. For the purpose of submission of bid proposals, the parties agree to nominate ……. as the leader duly authorized to sign and submit all documents and subsequent clarifications, if any, to the Client. However, M/s …… shall not submit any such proposals, clarifications or commitments before securing the written clearance of the other partner which shall be expeditiously given by M/s…….to M/s…….

4. The `Parties' have resolved that the distribution of responsibilities and their

proportionate share in the Joint Venture is as under:
(a) Lead Partner;
(i) ……
(ii) …….
(iii) …..
(b) Joint Venture Partner
(i) ……
(ii) …….
(iii) …..
[Similar details to be given for each partner]

5. JOINT AND SEVERAL RESPONSIBILITIES

The Parties undertake that they shall be jointly and severally liable to the Client in the discharge of all the obligations and liabilities as per the contract with the Client and for the performance of contract awarded to their JV.

6. ASSIGNMENT AND THIRD PARTIES

The parties shall co-operate throughout the entire period of this MOU on the basis of exclusivity and neither of the Parties shall make arrangement or enter into agreement either directly or indirectly with any other party or group of parties on matters relating to the Project except with prior written consent of the other party.

7. EXECUTIVE AUTHORITY

The said Joint Venture through its authorized representative shall receive instructions, payments from the Client. The management structure for the project shall be prepared by mutual consultations to enable completion of project to quality requirements within permitted cost and time.

8. BID SECURITIES

Till the award of the work, JV firm/Lead Partner of JV firm shall furnish Bid Security to the Client on behalf of the joint venture which shall be legally binding on all the members of the Joint Venture.

9. BID SUBMISSION

Each Party shall bear its own cost and expenses for preparation and submission of the bid and all costs until conclusion of a contract with the Client for the Project. Common expenses shall be shared by all the parties in the ratio of their actual participation.

10. INDEMNITY

Each party hereto agrees to indemnify the other party against its respective parts in case of breach/default of the respective party of the contract works of any liabilities sustained by the Joint Venture.

11. For the execution of the respective portions of works, the parties shall make their own

arrangements to bring the required finance, plants and equipment, materials, manpower and other resources.

12. DOCUMENTS & CONFIDENTIALITY

Each Party shall maintain in confidence and not use for any purpose related to the Project all commercial and technical information received or generated in the course of preparation and submission of the bid.

13. ARBITRATION

Any dispute, controversy or claim arising out of or relating to this agreement shall be settled in the first instance amicably between the parties. If an amicable settlement cannot be reached as above, it will be settled by arbitration in accordance with the Indian Arbitration and Conciliation Act 1996 or any amendments thereof. The venue of the arbitration shall be Delhi.

14. VALIDITY

This Agreement shall remain in force till the occurrence of the earliest to occur of the following, unless by mutual consent, the Parties agree in writing to extend the validity for a further period.

a. The bid submitted by the Joint Venture is declared unsuccessful, or
b. Cancellation/ shelving of the Project by the client for any reasons prior to award of work
c. Execution of detailed JV agreement by the parties, setting out detailed terms after award of work by the Client.

15. This MOU is drawn in …. number of copies with equal legal strength and status. One copy is held by M/s …… and the other by M/s……. & …….M/s ……. and a copy submitted with the proposal.

16. This MOU shall be construed under the laws of India.

17. NOTICES

Notices shall be given in writing by fax confirmed by registered mail or commercial courier to the following fax numbers and addresses:

Lead Partner	Other Partner(s)
……	……
(Name & Address)	(Name & Address)

IN WITNESS WHEREOF THE PARTIES, have executed this MOU the day, month and year first before written.

M/s……..	M/s…….
……	……..
(Seal)	(Seal)

Witness
1…….. (Name & Address)
2…….. (Name & Address)

Notes: (1) In case of existing joint venture, the certified copy of JV Agreement may be furnished.

FORM No. 10

DRAFT FORMAT OF JOINT VENTURE AGREEMENT

To be executed on non-judicial stamp paper of appropriate value in accordance with relevant Stamp Act and to be registered with appropriate authority under Registration Act.

The JV agreement shall be structured generally as per contents list given below:

A. CONDITIONS AND TERMS OF JV AGREEMENT

1. Definitions and Interpretation
2. Joint Venture – Include Equity of members, transferability of shareholding of equity of a partner leaving during the subsistence of the contract.
3. Proposal Submission
4. Performance – To indicate scope of responsibility of each member
5. Language and Law
6. Exclusively
7. Executive Authority
8. Documents
9. Personnel
10. Assignment and Third Parties
11. Severability
12. Member in Default
13. Duration of the Agreement
14 Liability and sharing of risks
15. Insurance
16. Sharing of Promotion and Project Costs, Profits, Losses and Remuneration
17. Financial Administration and Accounting
18. Guarantees and Bonds
19. Arbitration
20. Notices
21. Sole Agreement and Variation

B. SCHEDULES

1. Project and Agreement Particulars
2. Financial Administration Services
3. Allocation of the obligations
4. Financial Policy and Remuneration

*****

FORM No. 11

PRO-FORMA LETTER OF PARTICIPATION FROM EACH PARTNER OF JOINT VENTURE (JV)

(To be executed on non-judicial stamp paper of appropriate value in accordance with relevant Stamp Act and to be registered with appropriate authority under Registration Act.)

No…. Dated

From:
……..
……..

To,
The General Manager/Co,
Dedicated Freight Corridor Corporation of India Ltd.,
3rd Floor, Shree Balaji Complex, Plot No. C-2, Pocket-B, Sector -1, Ved Vyas Puri,
Meerut -250002, U.P.
.

Gentlemen,

Re: … "*[Insert name of work*] …….".

Ref: Your notice for Invitation for Bid (IFB) No. **MTC/EN/KRJ-DER-LXING/EDFC/3ROB** dated …….

1. We wish to confirm that our company/firm has formed a Joint Venture with(i)……. & ii) ……. for the purposes associated with IFB referred to above.

*(Members who are not the lead partner of the JV should add the following paragraph) *.*

2. 'The JV is led by … whom we hereby authorise to act on our behalf for the purposes of submission of Bid for ……. and authorise to incur liabilities and receive instructions for and on behalf of any and all the partners or constituents of the Joint Venture.'

OR

*(Member(s) being the lead member of the group should add the following paragraph) **

2. 'In this group we act as leader and, for the purposes of applying for Bid, represent the Joint Venture:

3. In the event of our JV being awarded the contract, we agree to be jointly with i) & ii) …… (names of other members of our JV) and severally liable to the Dedicated Freight Corridor Corporation of India Limited, its successors and assigns for all obligations, duties and responsibilities arising from or imposed by the contract subsequently entered into between Dedicated Freight Corridor Corporation of India Limited and our JV.

4. ***I/We, further agree that entire execution of the contract shall be carried out exclusively through the lead partner.**

Yours faithfully,
(Signature)
(Name of Signatory) …….
(Capacity of Signatory) …….
Company Seal * Delete as applicable

Note: In case of existing joint venture, the certified copy of JV Agreement may be furnished.

FORM No. 12

FORMAT FOR POWER OF ATTORNEY FOR AUTHORISED SIGNATORY OF JOINT VENTURE (JV) PARTNERS

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 company who is issuing the power of Attorney*)

Know all men by these presents, we … do hereby constitute, appoint and authorise Mr/Ms. …. who is presently employed with us and holding the position of ……as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our bid for the work of
… Including signing and submission of all documents and providing information / responses to Dedicated Freight Corridor Corporation of India Limited, representing us in all matters, dealing with Dedicated Freight Corridor Corporation of India Limited in all matters in connection with our bid for the said project.

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.

Dated this the …… day of ……. 2019.

(Signature of authorised Signatory)

Signature of Lead Partner **Signature of JV Partner(s)**

…… **……**

(Signature and Name in Block letters of Signatory)
Seal of Company

Witness

Witness 1:
Name:

Address:
Occupation:

Witness 2:
Name:

Address:
Occupation:

**Notes:*

i) To be executed by all the partners jointly, in case of a Joint Venture.

FORM No. 13

FORMAT FOR POWER OF ATTORNEY TO LEAD PARTNER OF JOINT VENTURE (JV)

(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 company who is issuing the power of Attorney)

POWER OF ATTORNEY*

Whereas Dedicated Freight Corridor Corporation of India Limited has invited Bids for the work of Construction of 2 Lane ROB including approaches and LHS in lieu of level crossings for LC No. 43 at IR chainage 97/26-27 on Meerut City – Saharanpur section of Northern Railway near Khatauli Railway Station for Eastern Dedicated Freight Corridor"

Whereas, the members of the Joint Venture comprising of M/s. …, M/s. …, M/s. ……, and M/s. …. are interested in submission of bid for the work of …*[Insert name of work*]… in accordance with the terms and conditions contained in the bidding documents.

Whereas, it is necessary for the members of the Joint Venture to designate one of them as the Lead Partner, with all necessary power and authority to do, for and on behalf of the Joint Venture, all acts, deeds and things as may be necessary in connection with the Joint Venture's bid for the project, as may be necessary in connection the Joint Venture's bid for the project.

NOW THIS POWER OF ATTORNEY WITNESSETH THAT:
We, M/s. ……., hereby designate M/s. ……, being one of the partners of the Joint Venture, as the lead partner of the Joint Venture, to do on behalf of the Joint Venture, all or any of the acts, deeds or things necessary or incidental to the Joint Venture's bid for the contract, including submission of bid, participating in conferences, responding to queries, submission of information/ documents and generally to represent the Joint Venture in all its dealings with the Railway / DFCCIL or any other Government Agency or any person, in connection with the Bid/contract for the said work until culmination of the process of bidding till the contract agreement if successful, is entered into with the Dedicated Freight Corridor Corporation of India Limited and thereafter till the expiry of the contract agreement.

**To be executed by all the members of the JV except 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.

We hereby agree to ratify all acts, deeds and things lawfully done by lead member, 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/ Joint Venture.

Dated this the …… Day of ……... 2019

…….
(Signature)

……
(Name in Block letters of Executants)
Seal of Company

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

FORM No. 14

Registered Acknowledgement Due

PROFORMA FOR TIME EXTENSION

No. _____ Dated: _____

_____
_____

Sub: (i) _____*(name of work).*
(ii) Acceptance letter no. _____
(iii) Understanding/Agreement no. _____

Ref: _____ (Quote specific application of Contractor for extension to the date received) _____

Dear Sir,

1. The stipulated date for completion of the work mentioned above is _____. From the progress made so far and the present rate of progress, it is unlikely that the work will be completed by the above date (or 'However, the work was not completed on this date').

2. Expecting that you may be able to complete the work, if some more time is given, the competent authority, although not bound to do so, hereby extends the time for completion from_____ to _____.

3. Please note that an amount equal to the liquidated damages for delay in the completion of the work after the expiry of _____ *(give here the stipulated date for completion with/without any penalty fixed earlier)* will be recovered from you as mentioned in Clause, 17-B of the Standard General Conditions of Contract for the extended period, notwithstanding the grant of this extension. You may proceed with the work accordingly.

4. The above extension of the completion date will also be subject to the further condition that no increase in rates on any account will be payable to you.

5. Please intimate within a week of the receipt of this letter your acceptance of the extension of the conditions stated above.

6. Please note that in the event of your declining to accept the extension on the above said conditions or in the event of your failure after accepting or acting upto this extension to complete the work by _____ (here mention the extended date),

further action will be taken in terms of Clause 62 of the Standard General Conditions of Contract.

Yours faithfully

For and on behalf of the Employer
Name of the Official: -

Stamp/Seal of the Employer

FORM No. 15

CERTIFICATE OF FITNESS

1. (a) Serial Number _____
   (b) Date _____

2. Name of person examined _____
   I certify that I have personally examined *(name)*_____

3. Father's Name: son/daughter of _____ , residing at _____

4. Sex _____

5. Residence: _____

6. Date of birth, if available, and/or certified age _____

7. Physical fitness _____

8. Identification marks _____
   _____

Who is desirous of being employed in a factory or on a work requiring manual labour and that his / her age as nearly as can be ascertained from my examination, is _____ years and that he/she is fit for employment in a factory or on a work requiring manual labour as an adult/child.

9. Reasons for:

   (a) refusal to grant certificate, or
   (b) revoking the Certificate

_____
_____

_____
Signature or Left Hand
Thumb Impression of the
person Examined

_____
Signature of Certifying Surgeon

Note: In case of physical disability, the exact details of the cause of the physical disability should be clearly stated

FORM No. 16
Registered Acknowledgement Due

PROFORMA OF 7 DAYS NOTICE
DFCCIL
(Without Prejudice)

To
M/s _____
_____

Dear Sir,

Contract Agreement No. _____
In connection with _____

1. In spite of repeated instructions to you by the subordinate offices as well as by this office in various letters of even no. _____, dated _____; you have failed to start work/show adequate progress and/or submit detailed programme for completing the work.

2. Your attention is invited to this office/Chief Engineer's office letter no. _____ _____, dated _____ in reference to your representation, dated _____.

3. As you have failed to abide by the instructions issued to commence the work/to show adequate progress of work you are hereby given 7 days' notice in accordance with Clause 62 of Standard General Conditions of Contract to commence works / to make good the progress, failing which further action as provided in Clause 62 of the Standard General Conditions of Contract viz. to terminate your Contract and complete the balance work without your participation will be taken.

Kindly acknowledge receipt.

Yours faithfully

For and on behalf of the Employer
Name of the Official: -

Stamp/Seal of the Employer

FORM No. 17
Registered Acknowledgement Due

PROFORMA OF 48 HRS. NOTICE
DFCCIL
(Without Prejudice)

To

M/s _____
_____

Dear Sir,

Contract Agreement No. _____
In connection with _____

1. Seven days' notice under Clause 62 of Standard General Conditions of Contract was given to you under this office letter of even no., dated _____; but you have taken no action to commence the work/show adequate progress of the work.

2. You are hereby given 48 hours' notice in terms of Clause 62 of Standard General Conditions of Contract to commence works / to make good the progress of works, failing which and on expiry of this period your above contract will stand rescinded and the work under this contract will be carried out independently without your participation and your Security Deposit shall be forfeited and Performance Guarantee shall also be encashed and consequences which may please be noted.

Kindly acknowledge receipt.

Yours faithfully

For and on behalf of the Employer
Name of the Official: -

Stamp/Seal of the Employer

FORM No. 18
Registered Acknowledgement Due

PROFORMA OF TERMINATION NOTICE
DFCCIL
(Without Prejudice)

No. _____ Dated _____

To
M/s _____
_____

Dear Sir,

Contract Agreement No. _____
In connection with _____

Forty-eight hours (48 hrs.) notice was given to you under this office letter of even no., dated _____; but you have taken no action to commence the work/show adequate progress of the work.

Since the period of 48 hours' notice has already expired, the above contract stands rescinded in terms of Clause 62 of Standard General Conditions of Contract and the balance work under this contract will be carried out independently without your participation. Your participation as well as participation of every member/partner in any manner as an individual or a partnership firm/JV is hereby debarred from participation in the tender for executing the balance work and your Security Deposit shall be forfeited and Performance Guarantee shall also be encashed.

Kindly acknowledge receipt.

Yours faithfully

For and on behalf of the Employer
Name of the Official: -

Stamp/Seal of the Employer

FORM No. 19

SAMPLE
FORMAT OF BANK GUARANTEE FOR MOBILISATION ADVANCE

(Clause 1.5.20, Part - I, Chapter - V)

Bank guarantee made on this ……. Between …… (hereinafter called "**the Bank**") of the One Part and Dedicated Freight Corridor Corporation of India Limited. (hereinafter called "**the Employer**") of the other Part.

WHEREAS Dedicated Freight Corridor Corporation of India Limited has awarded the Contract no……. for "……." (hereinafter called "**the Contractor**"), having its registered office at ……..

AND WHEREAS vide Clause 1.5.20 of Part - I, Chapter V, Special Conditions of Contract, Mobilization Advance up to ___% (___ percent) of the original contract value of Rs……. is payable to the contractor against Bank Guarantees, the contractor hereby applies for Mobilization Advance of ___% (___ percent) amounting to Rs……. /- (Rupees……) of the Contract Price,

Now, we the undersigned, Bank of ……., being fully authorized to sign and to incur obligations for and on behalf of and in the name of Bank of ……. hereby declare that the said Bank will guarantee the Employer the full amount of Rs. ……. /- (Rupees……) as stated above.

We, Bank of ……., do hereby unconditionally, irrevocably and without demur guarantee and undertake to pay the Employer immediately on demand any or all money payable by the contractor to the extent of Rs. ……. /- (Rupees……) without any demur, reservation, context, recourse or protest and/or without any reference to the contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the contractor on any dispute pending before any court, Tribunal, Arbitrator or any other authority. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Employer discharges this guarantee.

This guarantee is valid till …….

At any time during the period in which this guarantee still valid of the contractor fails to fulfil its obligation under the Contract, it is understood that the Bank will extend this guarantee under the same condition for the required time on demand by the Employer at the cost of the contractor.

The Guarantee hereinbefore contained shall not be affected by any change in the constitution of the Bank or of the contractor.

The neglect or forbearance of the Employer in enforcement of payment of any money, the payment whereof is intended to be hereby secured or the giving of time by the Employer for the payment hereof shall in no way relieve the Bank of their liability under this Deed.

The expressions "the Employer", "the Bank" and "the contractor" hereinbefore used shall include their respective successors and assigns.

Notwithstanding anything contained herein:

Our liability under this Bank Guarantee shall not exceed Rs……. /- (Rupees…….)

This bank Guarantee shall be valid up to…….

We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before …… (date of expiry of Guarantee).

In witness whereof we of the Bank have signed and sealed this Guarantee on the ……day of ……. being herewith duly authorized.

For and on behalf of the Bank of.....

Signature of Authorized Bank Official

Name .....
Designation .....
Stamp/Seal of the bank .....
Signed, sealed and delivered for and on
Behalf of the bank by the above named

..... in the presence of
Witness 1
Signature .....
Name .....
Address .....
Witness 2
Signature .....
Name .....
Address .....

FORM No. 20

PRE-CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on----------day of the month of---------- 20xx, between, on one hand, the DFCCIL acting through Shri ---------- Designation of the officer, (hereinafter called the CLIENT, which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/s---------- represented by Shri ----------Chief Executive Officer (hereinafter called the "BIDDER/SELLER" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second part.

WHEREAS the CLIENT proposes to procure (Name of the Stores/Equipment/Item, Name of the Consultancy Service, Name of Works Contract, Name of Services) and the [A] is willing to Offer/has offered for stores or works.

WHEREAS the [A] is a private company/ public company/ Government undertaking/ partnership/ registered export agency, constituted in accordance with the relevant law in the matter and the CLIENT is a PSU performing its functions or behalf of the President of India.

NOW, THEREFORE,

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

Enabling the CLIENT to obtain the desired said (Name of the Stores/Equipment/Item, Name of the Consultancy Service, Name of Works Contract, Name of Services) at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDERs to abstain from bribing or indulging in any corrupt practice in order to secure [B] by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the CLIENT will commit to prevent corruption, in any form, by its Officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

Commitments of the CLIENT

1.0 The CLIENT undertakes that no official of the CLIENT, connected directly or indirectly with the [B], will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the [A] either for themselves or for any person, organization or third party related to the [B], in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the [B].

1.1 The CLIENT will, during the pre-contract stage, treat all BIDDERs alike, and will provide to all BIDDERs the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular [A] in comparison to other BIDDERs.

1.2 All the officials of the CLIENT will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

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

Commitments of BIDDERS

3. The [A] commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage) in order to secure the [B] contract or in furtherance to secure it and in particular committee itself to the following: -

3.1 The [A] will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission fees, brokerage or inducement to any official of the CLIENT, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the (B] in exchange for any

advantage in the bidding, evaluation, contracting and implementation of the [B].

3.2 The (A] further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any Material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the CLIENT or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the [B] or any other [B] with the Government for showing or forbearing to show favour or disfavour to any person in relation to the [B] or any other [B] with the Government.

3.3 * [A] shall disclose the name and address of agents and representatives and Indian [A] shall disclose their foreign principals or associates.

3.4 * [A] shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract.

3.5 The [A] further confirms and declares to the CLIENT that the [A] is the original manufacturer/integrator/authorized government sponsored export entity of the defence stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the CLIENT or any of its functionaries, whether officially or unofficially to the award of the [B] to the [A] nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

3.6 The [A] either while presenting the bid or during pre-contract negotiations or before signing the [B] shall disclose any payments he has made, is committed to or intends to make to officials of the CLIENT or their family members, agents, brokers or any other intermediaries in connection with the [B] and the details of services agreed upon for such payments.

3.7 The [A] will not collude with other parties interested in the [B] to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the [B].

3.8 The [A] will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

3.9 The [A] shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the CLIENT as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The [A] also undertakes to exercise due and adequate care lest any such information is divulged.

3.10 The [A] commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

3.11 The [A] shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

3.12 If the, [A] or any employee of the [A] or any person acting on behalf of the [A], either directly or Indirectly, is a relative of any of the officers of the CLIENT, or alternatively, if any relative of an officer of the CLIENT has financial. Interest/stake in the Bidder's firm, the same shall be disclosed by the [A] at the time of filling of tender.

The term 'relative' for this purpose would be as defined in section 6 of the companies act 1956.

3.13 The [A] shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the CLIENT.

4. Previous Transaction

4.1 The [A] declares that no previous transgression occurred in the last three years immediately before signing of this integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any public sector enterprise in India or any Government department in India that could justify BIDDER's from the tender process.

4.2 The [A] agrees that if it makes incorrect statement on this subject, [A] can be disqualified from the ender process or the contact, if already awarded, can be terminated for such reason.

5. Earnest Money (Security Deposit)

5.1 Earnest money/ Bid Security/ Security Deposit/ Retention money/ Performance guarantee shall be as per the provisions of Bid document.

6. Sanctions for Violations

6.1 Any breach of the aforesaid provisions by the [A] or any one employed by it or acting on its behalf (whether with or without the knowledge of the [A] shall entitle the CLIENT to take all or any one of the following actions, wherever required: -

(i) To immediately call off the pre-contract negotiations without assigning any reason or giving any compensation to the [A]. However, the proceedings with the other BIDDER(s) would continue.

(ii) The earnest money deposit (in pre-contract stage) and/or security Deposit/performance Bond (after the [B] is signed) shall stand forfeited fully and the CLIENT shall not be required to assign any reason therefore.

(iii) To immediately cancel the [B], if already signed, without giving any compensation to the [A].

(iv) To recover all sums already paid by the CLIENT, and in case of an Indian [A] with interest thereon at 2% higher that the prevailing prime lending rate of state bank of India, while in case of a [A] from the country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to [A] from the CLIENT in connection with any other [B], such outstanding payment could also be utilized to recover the aforesaid sum and interest.

(v) To encash the advance bank guarantee and performance bond, if furnished by the [A], in order to recover the payments, already made by CLIENT, along with interest.

(vi) To cancel all or any other contracts with the [A]. The [A] shall be liable to pay compensation for any loss or damage to the Client resulting from such cancellation/rescission and the client shall be entitled to deduct the amount so payable from the money(s) due to the [A].

(vii) To debar the [A] from participating in future bidding processes of the Government of India for a minimum period of five years, which may be further extended at the discretion of the CLIENT.

(viii) To recover all sums paid in violation of this pact by [A]) to any middleman or agent or broker with a view a view to securing [B] the contract.

(ix) In cases where irrevocable letters of credit have been received in respect of any [B] signed by the client with the [A], the shall not be opened.

(x) Forfeiture of Performance Bond in case of a decision by the client to forfeit the same without assigning any reason for imposing sanction for violation of this pact.

6.2 The client will be entitled to take all or any of the actions mentioned at para 6.1(i) to (x) of this pact also on the commission by the [A] or any one employed by it or acting on its behalf (whether with or without the knowledge of the [A], of an offence as defined in chapter IX of the Indian penal code,

1860 or prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of the CLIENT to the effect that a breach of the provisions of this pact has been committed by the [A] shall be final and conclusive on the [A]. However, the [A] can approach the Independent Monitor(s) appointed for the purposes of this Pact.

7. Fall Clause

7.1 The [A] undertakes that it has not supplied/is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Ministry/Department of the Government of India or PSU and if it is found at any stage that similar product/system or sub systems way supplied by [A] to any other Ministry/Department of the Government of India or a PSU at a lower price, then that very price, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be refunded by the [A] to the CLIENT, if the [B] has already been concluded.

8. Independent Monitors

8.1 The CLIENT has appointed Independent Monitors (hereinafter referred to as Monitors) for this pact in consultant with the central vigilance commission (Names and addresses of the Monitors to be given)

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

8.3 The monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

8.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.

8.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the CLIENT

8.6 The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the CLIENT including that provided by the BIDOER. The [A] 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 Subcontractors. The Monitor shall be und 'contractual obligation to treat the information and documents of the [A] with confidentiality.

8.7 The client will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.

8.8 The monitor will submit a written report to the MD/DFCCIL within 8 to 10 weeks from the date of reference or intimation to him by the CLIENT/BIDDER and, should the occasion arise, submit proposal for correcting problematic situations.

9. Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the CLIENT or its agencies shall be entitled to examine all the documents including the Books of Accounts of the [A] and the [A] shall provide necessary information and documents in English and shall exte4nd all possible help for the purpose of such examination.

10. Law and Place of Jurisdiction

This pact is subject to Indian law. The place of performance and jurisdiction is the seat of the CLIENT.

11. Other Legal Actions

The actions stipulated in this integrity pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

12. Validity

12.1 The validity of this integrity pact shall be from date of its signing and extend upto 5 years or the complete execution of the [B] to the satisfaction of both the CLIENT and the [A] including warranty period, whichever is later. In case [A] is unsuccessful, this integrity pact shall expire after six months from the date of the signing of the [B].

12.2 Should one or several provisions of this pact turn out to be invalid; the remainder of this pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

13. The parties hereby sign this integrity pact at …… On ……

CLIENT	BIDDER
Name of the officer	CHIEF EXEUCTIVE OFFICER
Designation	
Deptt. /Ministry/PSU	

Witness witness

1. …… 2. ……

Note:

[A]- To be replaced by BIDDER/Seller/Consultant/Consultancy firm/Service provider as the case was may be

[B]- To be replaced by contract/supply contract/consultancy contract/works contract as the case was may be.

FORM No. 21

FORMAT FOR AFFIDEVIT TO BE UPLODED BY TENDERER ALONGWITH THE TENDER DOCUMENT

(To be executed in presence of Public notary on non-judicial stamp paper of the value of Rs. 100/- The stamp paper has to be in the name of the tenderer)** Tender Notice No……..

Name of Work:……

I …… (Name and designation)** appointed as the

attorney/authorized signatory of the tenderer (including its constituents),

M/s ……. (hereinafter called the tenderer) for the

purpose of the Tender documents for the work of ……

……..as per the tender No…….. ……..of DFCCIL,

do hereby solemnly affirm and state on the behalf of the tenderer including its constituents as under:

10. I/we the tenderer(s), am/are signing this document after carefully reading the contents.

11. I/we the tenderer(s) also accept all the conditions of the tender and have signed all the pages in confirmation thereof.

12. I/we hereby declare that I/we have downloaded the tender document from the website www.ireps.gov.in. I/we have verified the content of the document from the website and there is no addition, no deletion or no alteration to the content of the tender document. In case of any discrepancy noticed at any stage i.e. evaluation of tenders, execution of work of final payment of the contract, the master copy available with the DFCCIL shall be final and binding up me/us.

13. I/we declare and certify that I/we have not made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements.

Signature of tenderer (s)
with seal

14. **I/we also understand that my/our offer will be evaluated based on the document/credentials submitted along with the offer and same shall be binding upon me/us.**

15. **I/we declare that the information and documents submitted along with the tender by me/us are correct and I/we are fully responsible for the correctness for the information and documents, submitted by us.**

16. I/we understand that if the certificates regarding eligibility criteria submitted by us are found to be forged/false or incorrect at any time during process for evaluation of tenders, it shall lead to forfeiture of the tender EMD besides banning of business for five year on entire DFCCIL. Further, I/we

    (insert name of the tenderer)**……. and all my/our constituents understand that my/our offer shall be summarily rejected.

17. I/we also understand that if the certificates submitted by us found to be false/forged or incorrect at any time after the award of the contract, it will lead to termination of the contract, alongwith forfeiture of EMD/SD and

    Performance guarantee besides any other provided in the contract including banning of business for five year on entire DFCCIL.

DEPONENT

SEAL AND SIGNATURE

OF THE TENDERER

VERIFICATION

I/we above named tenderer do hereby solemnly affirm and verify that the contents of my/our above affidavit are true and correct. Nothing has been concealed and no part of it is false.

DEPONENT

SEAL AND SIGNATURE

OF THE TENDERER

Place:

Dated:

**The contents in Italics are only for guidance purpose. Details as appropriate, are to be filled in suitably by tenderer.

Attestation before Magistrate/Notary Pubic

Note: Under prevailing lockdown situation due to COVID-19, if it is not possible to obtain the notarized affidavit on a non-judicial stamp paper, the tenderers may submit the same declaration/certificate on their letter-head alongwith reasonable proof of lockdown situation prevailing at their place.

DRAWINGS

PART - V
DRAWINGS

5.1 General Arrangement Drawings with Key Plan:

S. No.	LC No.	IR CHAINAGE IN KM	SPAN CONFIGURATION IN 'm'	GENERAL ARRANGEMENT DRAWING No.	RDSO Drawings for superstructure
1.	43	97/26-27	1x72.0m Bow String Girder	MTC/EN/ROB/LC-43	**RDSO - Bow String Girder <u>72m span</u>** RDSO/B-10412 RDSO/B-10412/1 RDSO/B-10412/2 RDSO/B-10412/3 RDSO/B-10412/4 RDSO/B-10412/5 RDSO/B-10412/6 RDSO/B-10412/7 RDSO/B-10412/8
4.	43	97/26-27	20 x 24m PSC Girder and RE wall	RITES/RI/RCED/DFC/ROB.43/GAD/ North Approach and RITES/RI/RCED/DFC/ROB.43/GAD/ South Approach	-

Notes:

1. General Arrangement Drawings are attached as a part of tender document.
2. These GADs are indicative and for reference only.
3. The work shall be done as per final / detailed drawings.