



Tender No. EDFC_CGM_TDL_ROB_5C

For

Name of Work:- Construction of two lane Road Over Bridge (excluding approaches) having one span of 1x60.0 m using BOW String Girder at 01 No. Level Crossing in lieu of level crossings No. 5C at DFC Chainage 561/35-37 with construction of 1 no Limited Height Subway of size 4.0 M (width) X 2.5 M (height) by Box Pushing method under DFCCIL tracks and its approach DFC side only with contractor's own design drawings as per relevant IS/IRS/Railway Board Guidelines, between New Bhaupur to New Kanchosi section of CGM/TDL of Eastern Dedicated Freight Corridor Corporation of India Limited.

**E-TENDER
DOCUMENT
TECHNICAL BID
(PACKET-A)**

Single Stage-Two Packet
Open Online E-Tender

(PARTICIPATION THROUGH E-TENDER ONLY)

E-tendering site- <https://www.ireps.gov.in> / its link at www.dfccil.com
(Help desk of IREPS: 011 -23761525)

Employer:

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

Under

MINISTRY OF RAILWAYS

**Chief General Manager, Tundla,
Office Of Chief General Manager:- New Tundla Station/EDFC, Village- Bhakti Ghari, Tehsil-
Tundla,
District- Firozabad, (U.P.)-283204.**

**CORPORATE OFFICE
DFCCIL, 5TH Floor, Supreme Court Metro Station Building,
New Delhi-110001**

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NOTICE INVITING E-TENDER

PART - I
Chapter I

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

No: EDFC_CGM_TDL_ROB_5C

DATE: 17.02.2024

NOTICE INVITING E-TENDER
National Competitive Bidding

Dear Sirs,

Name of Work:- Construction of two lane Road Over Bridge (excluding approaches) having one span of 1x60.0 m using BOW String Girder at 01 No. Level Crossing in lieu of level crossings No. 5C at DFC Chainage 561/35-37 with construction of 1 no Limited Height Subway of size 4.0 M (width) X 2.5 M (height) by Box Pushing method under DFCCIL tracks and its approach DFC side only with contractor's own design drawings as per relevant IS/IRS/Railway Board Guidelines, between New Bhaupur to New Kanchosi section of CGM/TDL of Eastern Dedicated Freight Corridor Corporation of India Limited.

1.1.0 DFCCIL 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 Notice No.	EDFC_CGM_TDL_ROB_5C
Name of the work	Construction of two lane Road Over Bridge (excluding approaches) having one span of 1x60.0 m using BOW String Girder at 01 No. Level Crossing in lieu of level crossings No. 5C at DFC Chainage 561/35-37 with construction of 1 no Limited Height Subway of size 4.0 M (width) X 2.5 M (height) by Box Pushing method under DFCCIL tracks and its approach DFC side only with contractor's own design drawings as per relevant IS/IRS/Railway Board Guidelines, between New Bhaupur to New Kanchosi section of CGM/TDL of Eastern Dedicated Freight Corridor Corporation of India Limited.
Employer	Chief General Manager, Tundla, Office Of Chief General Manager:- New Tundla Station/EDFC, Village- Bhakti Ghari, Tehsil-Tundla, District- Firozabad, (U.P.)- 283204.
Engineer	Employer/Employer's authorized Representative
Type of Tender	Open E-Tender (<u>Single stage Two Packet</u>)
Type of Contract	Works Contracts
Estimated Cost	<u>Rs. 18,32,80,934.28/- (Including GST)</u> <u>(Rupees Eighteen Crore Thirty Two lacs Eighty thousand nine hundred thirty four rupees and twenty eight paisa only).</u>
GST	GST shall be reimbursed/paid separately on accepted Cost.
Period of Contract	08 months

Earnest Money	Rs. 10,66,500/-. (Rs. Ten lacs Sixty Six thousand Five hundred only). The Earnest Money shall be submitted in favour of DFCCIL in the form as detailed in Para 1.3.8 of Preamble & General Instructionsto Tenderers (Part-I, Chapter-III). The original Bank Guarantee of Bid Security or Earnest Money have to be submitted to Employer's office before the scheduled date and time of submission of the tender.
Cost of Tender Document	Rs. 11800 (including GST) The cost of the tender document shall be deposited through payment gateway provided on http://www.ireps.gov.in on or before schedule date and time of submission of Bid. The proof of submission of cost of tender document should be uploaded along with the Technical Bid.
E-tendering website	http://www.ireps.gov.in For any help, please contact IREPS Helpdesk at 011-23761525
Date of uploading of NIT & Bid documents(online publishing date)	On Date 17.02.2024
Date of document download/Sale (Online)	As per IREPS
Issue of Corrigendum, if any	As per IREPS system (on websites http://www.ireps.gov.in and www.dfccil.com)
Date & Time of Submission of Tender	On or before date <u>19.03.2024 and time upto 15:00 hrs</u>
Date and Time of Opening of Tender (Technical bids - PacketA)	<u>Date 19.03.2024 at 15.30 hrs</u> Opening date of Financial Bid (Packet-B) will be notified in IREPS only.
Validity of offer	120 days from the date of opening of the Technical Bid of the Tender
Security Deposit	5% of Contract value
Performance Bank Guarantee	Performance Guarantee (PG) have to be submitted within 21 (twenty-one) days from the date of issue of Letter of Acceptance (LOA), amounting to 5% of the contract value in the form as given in clause 16.4 of GCC
Defect Liability Period	12 Months

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

1.1.2 Tender document will be available on DFCCIL's website www.dfccil.com,

Tender document no **EDFC_CGM_TDL_ROB_5C**

<http://www.ireps.gov.in> & Central Procurement portal eprocure.gov.in. However, the tender shall be submitted only on <http://www.ireps.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 be summarily rejected.

1.1.3 DFCCIL may issue amendment(s) [addendum(s) / corrigendum(s)] to the tender documents. In such cases the amendment(s) shall be issued and placed on DFCCIL's website: www.dfccil.com and <http://www.ireps.gov.in> as per IREPS system. The tenderer who have downloaded the tender documents from the website before issue of amendment(s) must visit the website and ensure that such amendment(s) (if any) is also downloaded by them. Such amendment(s) (if any) shall also be uploaded duly stamped and signed / digitally signed along with the submission of tenders. **Any tender submitted without amendment(s) (if any) shall be liable to be rejected.**

1.1.4 The tender documents shall be submitted in online mode only through website <http://www.ireps.gov.in> in two e-Packets 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 % age above or below or at par on the amount of Schedules duly filled in along with Schedule of Prices (Form - 4) are to be submit **online mode only** in "Financial Bid".

Tenderer shall submit the Cost of Tender Document in favour of DFCCIL as detailed in Para 1.3.4.3 of Preamble & General Instructions to Tenderers (Part-I, Chapter-III).

Tenderer shall submit the EMD as detailed in Para 1.3.8 of Preamble & General Instructions to Tenderers (Part-I, Chapter-III). Office of Employer, (**Address- Chief General Manager/ TDL and New Tundla Station/EDFC, Village- Bhakti Ghari, Tehsil-Tundla, District-Firozabad, (U.P.)-283204.**) on or before the scheduled date and time of submission of tender.

Financial Bid (as specified in "Financial Bid" in Tender Document) duly filled in is to be uploaded in "Financial packet".

1.1.6 Procedure for e-tendering

1.1.6.1 Accessing/ purchasing of Tender Documents.

1.1.6.2 It is mandatory for all the Bidders to have class-III Digital Signature Certificate (DSC) from any of the licensed certifying agency (Bidders can see the list of licensed certifying agencies from the link www.cca.gov.in) to participate in e-tendering.

1.1.6.3 To participate in the Bidding, it is mandatory for the Bidders to register with IREPS portal to have user ID & password. IREPS portal is the only website for submission of Bid. Vender manual containing the detailed guidelines for e-tendering is available on IREPS portal. Following may kindly be noted:

(a) Registration with IREPS portal should be valid at least up to the date of submission of bid.

Tender document no **EDFC_CGM_TDL_ROB_5C**

(b) Bids can be submitted only during the validity of registration.

It is also mandatory for the Bidders to get their firms registered with e-tendering portal.

1.1.6.4 If the firm/ Consortium/ Joint Venture is already registered with e-tendering service provider, and validity of registration is not expired, then the firm/Consortium/Joint Venture is not required a fresh registration.

1.1.6.5 The complete Bidding Documents can be viewed / downloaded by the Bidder from IREPS portal as per the time and date mentioned on the IREPS portal.

1.1.7 Tenders shall be opened at the address given below as mentioned in Para 1.1.1 above in the presence of the tenderers or their authorized representatives intending to attend the opening.

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) Cost of Tender Document and Bid Security Deposit Details
- ii) Technical offer- Technical Bid (Packet-A)
- iii) Financial offer. (On a later date after scrutiny/evaluation of Technical Bid)

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

1.1.9 Any tender received without Earnest money and/or cost of tender documents in the form as specified in the tender documents 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 tendering 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 DFCCIL reserves the right to pre-qualify the bidder(s) provisionally based on the documents submitted by them and open financial bid(s), subject to their final verification. In the event of any document being found false, the provisional qualification shall stand withdrawn, and the next lower bidder shall automatically come to the position of such disqualified bidder. Action against such disqualified tenderers shall be taken as per above Clause No. 1.1.11 of Notice Inviting E-Tender.

1.1.13 Information as required as per various Forms to tender document should be submitted by the tenderers without fail strictly as per formats.

1.1.14 The validity of offer shall be 120 days from the date of opening of the Technical Bid of the tender.

1.1.15 Transfer of the tender document purchased by intending tenderer to another tenderer is not admissible. Tenderer can submit tenders only on the documents purchased /

Tender document no **EDFC_CGM_TDL_ROB_5C**

downloaded from the website <http://www.ireps.gov.in> by them.

1.1.16 Tenderers must read all instructions regarding e-tendering process as mentions in PREAMBLE & GENERAL INSTRUCTIONS TO TENDERERS Part-I, Chapter-III.

1.1.17 **Tenderers are advised to visit the DFCCIL website regularly for information regarding tender. Amendment(s) (if any) will be uploaded on DFCCIL website www.dfccil.com and / <http://www.ireps.gov.in> only.**

Chief General Manager/TDL

For & on behalf of DFCCIL

GENERAL INFORMATION/ DATA SHEET

PART - I
Chapter II

GENERAL INFORMATION / DATA SHEET

Tender Notice No.	EDFC_CGM_TDL_ROB_5C
Name of the work	Construction of two lane Road Over Bridge (excluding approaches) having one span of 1x60.0 m using BOW String Girder at 01 No. Level Crossing in lieu of level crossings No. 5C at DFC Chainage 561/35-37 with construction of 1 no Limited Height Subway of size 4.0 M (width) X 2.5 M (height) by Box Pushing method under DFCCIL tracks and its approach DFC side only with contractor's own design drawings as per relevant IS/IRS/Railway Board Guidelines, between New Bhaupur to New Kanchosi section of CGM/TDL of Eastern Dedicated Freight Corridor Corporation of India Limited.
Employer	Chief General Manager, Tundla, Office Of Chief General Manager:- New Tundla Station/EDFC, Village- Bhakti Ghari, Tehsil-Tundla, District- Firozabad, (U.P.)- 283204.
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GST	GST shall be reimbursed/paid separately on accepted Cost.
Period of Contract	08 months
Earnest Money	Rs. 10,66,500/- (Rs. Ten lacs Sixty Six thousand five hundred only) The Earnest Money shall be submitted in favour of DFCCIL in the form as detailed in Para 1.3.8 of Preamble & General Instructions to Tenderers (Part-I, Chapter-III). The original Bank Guarantee of Bid Security or Earnest Money have to be submitted to Employer's office before the scheduled date and time of submission of the tender.
Cost of Tender Document	Rs. 11800.0 The cost of the tender document shall be deposited through payment gateway provided on http://www.ireps.gov.in on or before schedule date and time of submission of Bid. The proof of submission of cost of tender document should be uploaded along with the Technical Bid.
E-tendering website	http://www.ireps.gov.in For any help, please contact IREPS Helpdesk at 011-23761525

Date of uploading of NIT & Bid documents(online publishing date)	On Date 17.02.2024
Date of document download/Sale (Online)	As per IREPS
Issue of Corrigendum, if any	Upto three days prior to the last date of submission (on websites http://www.ireps.gov.in and www.dfccil.com)
Date & Time of Submission of Tender	On or before date 19.03.2024 and time upto 15:00 hrs
Date and Time of Opening of Tender (Technical bids - PacketA)	Date 19.03.2024 at 15.30 hrs Opening date of Financial Bid (Packet-B) will be notified later
Validity of offer	120 days from the date of opening of the Technical Bid of the Tender
Security Deposit	5% of Contract value
Performance Bank Guarantee	Performance Guarantee (PG) have to be submitted within 21 (twenty-one) days from the date of issue of Letter of Acceptance (LOA), amounting to 5% of the contract value in the form as given in clause 16.4 of GCC
Defect Liability Period	12 Months
DFCCIL's Bank Account	The DFCCIL's Bank Account details is as under for making deposit in cash for the purpose of Security Deposit/ Performance Guarantee is as under: Name of Account: Dedicated Freight Corridor Corporation of India Ltd, Kanpur Name of Bank: Union Bank of India, Kamla Nagar, Agra Account No: 302601010780193 Type of Account: Current Account IFSC Code: UBIN0561657

**PREAMBLE
&
GENERAL INSTRUCTIONS TO TENDERERS**

PART-I
Chapter- III

PREAMBLE & GENERAL INSTRUCTIONS TO TENDERERS

1.3.1 Introduction

(i) Dedicated Freight Corridor

Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL), a public sector undertaking has been set up 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 Kilometers 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 Rewari/Tughlakabad/Dadri near Delhi. There will be a linkage between two corridors at Dadri.

(ii) Project Description

(Give brief of the section and project site to educate the tenderer about site condition)

(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. An e-tendering portal of Dedicated Freight Corridor Corporation of India (DFCCIL) introduced for the process of e-tendering which can be accessed on <http://www.ireps.gov.in> (Refer in the BID DOCUMENTS)

Words in capital and not defined in this document shall have the same meaning as in "BID DOCUMENTS".

Benefits to Suppliers/service providers are outlined on the Home-page of the portal.

A. ACCESSING / PURCHASING OF BID DOCUMENTS:

The Bidder who wishes to view free Notification and tender documents can visit DFCCIL's website www.dfccil.com or <http://www.ireps.gov.in> or Central Procurement Portal www.eprocure.gov.in. Interested bidders who wish to participate should visit website <http://www.ireps.gov.in>, which is the only website for bidding their offer. Further the procedure is as follows:

It is mandatory for all the Bidders to have class-III digital signature certificate

Tender document no EDFC_CGM_TDL_ROB_5C

(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.

To participate in the E-bid submission, it is mandatory for the Bidders to get themselves registered with the <http://www.ireps.gov.in> and to have user ID & password.

The BID DOCUMENTS can be viewed /downloaded from the <http://www.ireps.gov.in> free of cost till one day prior to last date of submission of the tender upto 24.00 hrs.

Following may be noted-

1. Bids can be submitted only during the validity of registration with the <http://www.ireps.gov.in>.
2. The amendments/clarifications to the BID DOCUMENTS, if any, will be posted on the DFCCIL website www.dfccil.com which can also be seen on <http://www.ireps.gov.in>.
3. Registration with the <http://www.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 IREPS website and the Bid may be submitted online following the instructions appearing on the screen. A Vendor manual containing the detailed guidelines for e-tendering system is also available on IREPS website.

Only Electronic Form (to be uploaded on the IREPS website)

Submission of Financial & Technical bid in prescribed Format in **ON LINE MODE ONLY**. No other mode of submission is accepted.

C. Document should be uploaded on the IREPS website (On line mode only)

- (a) Power of Attorney for signing the Application
- (b) If applicable, the Power of Attorney for Lead Member of JV;
- (c) 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.
- (d) SUBMISSION OF FIRMS CREDENTIALS in prescribed format mentioned in BID DOCUMENT
- (e) SUBMISSION OF TECHNICAL PROPOSAL in prescribed format mentioned in BID DOCUMENT,

- (f) 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;
- (g) Technical Bid Packet-A (duly signed & scanned or digitally signed), Financial Bid Packet-B (in online format) and other relevant documents
- (h) Deleted
- (i) Memorandum of Understanding (in case of JV) as per Form-9 (Part-IV, Chapter- II of BID DOCUMENT.
- (j) Cost of BID DOCUMENT as detailed in Para 1.3.4.3 of Part-I, Chapter-III (Preamble & General Instructions to Tenderer) in favour of DFCCIL,
- (k) EARNEST MONEY DEPOSIT as detailed in Para 1.3.8 of Part-I, Chapter-III (Preamble & General Instructions to Tenderer) in the acceptable form in favour of DFCCIL
- (l) Deleted
- (m) The Bidder shall upload signed and scanned or digitally signed copies of the documents on the IREPS website before scheduled date and time of submission of Tender. No hard copy of the documents is required to be submitted (except original instruments of earnest money deposit as detailed in BID DOCUMENT).

D. Modification / Substitution/ Withdrawal of bids:

- (i) The Bidder may modify, substitute or withdraw its e-bid after submission but prior to scheduled date and time of submission of tender. No Bid shall be modified, substituted or withdrawn by the Applicant after scheduled date and time of submission of tender.
- (ii) Any alteration/ modification in the Bid or additional information supplied subsequent to the scheduled date and time of submission of tender, unless the same has been expressly sought for by the Authority, shall be disregarded.
- (iii) For modification of e-bid, applicant/tenderer has to detach its old bid from e- tendering portal and upload / resubmit digitally signed modified bid.
- (iv) For withdrawal of bid, applicant/tenderer has to click on withdrawal icon at e-tendering portal and can withdraw its e-bid.
- (v) Before withdrawal of a bid, it may specifically be noted that after withdrawal of a bid for any reason, applicant/tenderer cannot re-submit e-bid again.

E. OPENING AND EVALUATION OF BIDS:

- (i) Opening of Bids will be done through online process.
- (ii) For participating in the tender, the authorized signatory holding Power of Attorney shall be the Digital Signatory. In case the authorized signatory holding Power of Attorney and Digital Signatory are not the same, the bid shall be considered non-responsive.

The DFCCIL Authority shall open bid documents received in electronic form at the scheduled date and time of opening of tender i.e. in the presence of the Bidders who choose to attend. The DFCCIL Authority will subsequently examine and evaluate the Bids in accordance with the provisions set out in the BID DOCUMENTS.

The Financial Bid will be opened of the pre-qualified and short listed Bidders. The date of opening of Financial Proposal will be notified later on.

F. ONLINE E-BIDDING METHODOLOGY:

Online E- Bid System – Financial bids & Technical bids shall be submitted by the bidder at the same time. First the Technical Bid will be opened at the time and date notified in the tender notice. The Financial Proposal will be opened of the pre-qualified and short listed Bidders after technical evaluation of Bids. The date of opening of Financial Bid will be notified later on.

G. BROAD OUTLINE OF ACTIVITIES FROM BIDDERS PERSPECTIVE:

- i. Procure a Digital Signing Certificate (DSC)
- ii. Registration Electronic Tendering System (ETS)
- iii. Create Users and assign roles on ETS
- iv. View Notice Inviting Tender (NIT) on ETS
- v. Download Official Copy of Tender Documents from ETS
- vi. Clarification to Tender Documents on ETS– Query to DFCCIL (Optional) – view response to queries posted by DFCCIL, through addenda.
- vii. Bid-Submission on ETS: Prepare & arrange all documents/papers for submission of bid & tender cost online and EMD deposit on online/offline as per instruction.
- viii. Attend Public Online Tender Opening Event (TOE) on ETS
- ix. Post-TOE Clarification on ETS (Optional)-Respond to DFCCIL's Post-TOE queries

For participating in this tender online, the following instructions are to be read carefully. These instructions are supplemented with more detailed guidelines on the relevant screens of the ETS.

Note 1: It is advised that all the documents to be submitted are kept scanned and converted to PDF format in a separate folder on your computer before starting online submission. The size of the each document should not be more than 3.75 MB.

H. 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-III 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>].

I. Registration

Intending bidders are requested to register themselves with IREPS portal through <https://www.ireps.gov.in> for obtaining user-id and password.

DFCCIL has decided to use process of e-tendering for inviting this tender and thus the physical copy of the tender would not be sold.

J. Help Desk for E-Tendering

For any assistance, IREPS helpdesk may be contacted. Helpdesk options are available at IREPS portal's Home Page. IREPS helpdesk contact no. is 011-23761525.

(iv) SCOPE OF WORK:

On behalf of President of India, Chief General Manager Dedicated Freight Corridor Corporation of India Limited, Office Of Chief General Manager:- New Tundla Station/EDFC, Village- Bhakti Ghari, Tehsil-Tundla, District- Firozabad, (U.P.)-283204. 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 two lane Road Over Bridge (excluding approaches) having one span of 1x60.0 m using BOW String Girder at 01 No. Level Crossing in lieu of level crossings No. 5C at DFC Chainage 561/35-37 with construction of 1 no Limited Height Subway of size 4.0 M (width) X 2.5 M (height) by Box Pushing method under DFCCIL tracks and its approach DFC side only with contractor's own design drawings as per relevant IS/IRS/Railway Board Guidelines, between New Bhaupur to New Kanchosi section of CGM/TDL of Eastern Dedicated Freight Corridor Corporation of India Limited.

The scope of work shall include but not limited to:

- (a) Construction of Pilling, pile cap, pier & pier cap work as per approved drawings.
- (b) Supply, Fabrication, Erection and Launching of Bow string Girder as mentioned in GAD (with power and traffic power blocks, as applicable).
- (c) Providing and fixing in position Bearings as per approved drawings including designs of bearings.
- (d) Preparation of Quality Assurance Plan (QAP), WPSS for fabrication of

- superstructure, preparation of Temporary Arrangement Drawings (TAD), Launching Scheme, Fabrication/Detail Shop Drawings including DODLs and execution as per these QAP/Drawings and preparation of documentation for processing PCE Sanction, as per extent rules/guidelines issued by the Railway Board.
- (e) Preparation of Quality Assurance Plan (QAP) for sub-structure, foundation, super-structure including bearings and ensuring the execution as per this QAP,
 - (f) Construction of Wall along the track for closing of existing LCs, drain all works related to constructing of ROB over DFCCIL and Railway.
 - (g) Preparation and submission of Design & Drawings of RCC box segments for insertion under running tracks/lines as per relevant design criteria of IS codes/IRS/IRBM/Guidelines issued by Railway Board. Design & Drawings are also to be proof checked by the contractor at its own expenses. Proof checks to be done through RITES/IITs/NITs or any reputed firm approved by DFCCIL.
 - (h) Preparation and submission of methodology of working and Box pushing under running tracks/lines to be approved by the DFCCIL.
 - (i) Making any temporary work for the purpose or arranging any temporary land for the working or stacking of materials of contractor.
 - (j) Temporary Works: Making any temporary work to facilitate construction and for the purpose of arranging any temporary land for the working or stacking of materials of contractor at no extra cost.
 - (k) Incidental Works: Safety, Health & Environment (SHE) compliances, Quality Assurance, Interface Management with other contractor, Restoration of existing roads and services other than being relocated / dislocated on account of DFC alignment during construction, management of road traffic around the worksite at no extra cost:-
 - (l) Obtaining relevant certificates or clearances from local/civil authorities viz. permits, licenses, completion certificate, fire clearance or any other mandatory clearances which maybe specified by these authorities from time to time.
 - (m) Obtaining permission for Works with or without traffic block from concerned Railway authority/interfacing agencies for work in close vicinity of Indian Railway track, wherever applicable and DFCC shall assist in obtaining such permits.
 - (n) Benchmarking, setting out, photography, videography, permanent markers like land boundary pillars, signages, boards etc. As-Built drawings, inspection books, registers for record & maintenance of bridges/ alignment etc.
 - (o) Submission of periodical progress reports with site photos and videos, attending progressreview meetings with employer/concerned authorities.
 - (p) Other miscellaneous works as listed in Schedules / GCC/ SCC.

Note: The scope of work is only indicative and as per requirement, more ROB, FOBs, Bridges, earthwork may be added in the scope of work or location may change. The span arrangement of the bridges is also indicative.

(v) **Cost of the work:**

The estimated cost of the tendered work is indicated in Part-I, Chapter-II (General Information/ Data Sheet)

- (vi) The tenderer shall be governed by General Conditions of Contract (GCC), Preamble & General Instructions to Tenderers (ITT), Special Conditions of Contract (SCC), technical specification etc. 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.
- (vii) **Location:**
- (viii) Works are to be executed as per GAD in lieu of LC No. 5C at IR Chainage 1091/7-9 & DFC Chainage 561/35-37 between Kanpur-Etawah Section of Prayagraj Division, Northern Central Railway & New Kanchosi – New Achalda section of EDFC. 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 <https://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) and para 1.3.2 (b) (ii), here in after called "TECHNICAL BID "

Packet- B

Price elements of the Tender Bid as per para 1.3.2 (b) (iii), herein after called "FINANACIAL 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 submitted 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 submitted in the proper Forms are liable to be rejected.

(i) **Documents to be submitted in the office of CGM/TDL/DFCCIL:-**

S. No	Description	Documents
(1)	Earnest Money Document (in case of Earnest Money submitted in the form of Bank Guarantee)	Original instruments of EMD (Bank Guarantee) in sealed envelope.

(ii) **Documents to be enclosed with the TECHNICAL BID (Packet- A):-**

S. No	Description	Documents
(1)	Offer letter complete.	Form No.1
(2)	Tenderer's credentials in accordance with Para 1.3.13 (i), (ii) & (iii) of Part-I, Chapter-III (Preamble & General Instructions to Tenderers).	Form No. 2A, 2B, 2C & 2D
(3)	Affidavit for authenticity of certificates/ documents	Form No. 22
(4)	Details of Earnest money in accordance with Para 1.3.8 and Cost of Tender Document in accordance with Para 1.3.4.3 of Part-I, Chapter-III (Preamble & General Instructions to Tenderers)	
(5)	Written confirmation authorizing the signatory of the tender to commit the tenderer and other documents as per format as applicable, in accordance with para 1.3.6 of Part-I, Chapter-III (Preamble & General Instructions to Tenderers).	

(iii) **Documents to be enclosed 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 Tender Document

This tender document consists of following five parts:

PART/ CHAPTER S	DESCRIPTION
PART - I	
Chapter I	Notice Inviting E-Tender
Chapter II	General Information / Data sheet

Chapter III	Preamble & General Instructions to Tenderers
Chapter IV	General Conditions of Contract (GCC)
Chapter V	Special Conditions of Contract (SCC)
PART - II	Technical Specifications
Chapter I	General Guidelines regarding Specifications and Special Conditions for Supply of Cement for Construction works
Chapter II	General Guidelines regarding Specifications and Special Conditions for Concrete Works
Chapter III	General Guidelines regarding Specifications and Special Conditions for Bored Cast in-situ RCC Pile Foundations
Chapter IV	General Guidelines regarding Specifications and Special Conditions for Supply of Reinforcement and Structural Steel
Chapter V	General Guidelines Regarding Specifications and Special Conditions For Fabrication , Erection & Launching of Steel Plate Girder/Bow String Girder/Open Web Girder For ROB/FOB
PART - III	Additional Technical Specifications
Chapter I	Stud Shear Connectors
Chapter II	Load Testing of Bridges
Chapter III	Roads and Reinforced earth construction
Chapter IV	Non-Destructive Integrity Testing of Concrete Piles
Chapter V	Precautions while working in close proximity of existing Indian Railways Track
Chapter VI	Codes & Specifications to be followed
Chapter VII	Priority of Documents
PART - IV	
Chapter I	Milestones and Time Schedule
Chapter II	Tender Forms (including Schedule of Prices)
PART - V	Drawings

1.3.4 Sale and Submission of Tender Document

1.3.4.1 Tender document can be viewed from DFCCIL's website www.dfccil.com, <https://www.ireps.gov.in> & Central Procurement portal eprocure.gov.in. Amendment(s) (if any) will be uploaded on DFCCIL website www.dfccil.com and <https://www.ireps.gov.in> only. For submitting the tender, the Tender documents and amendment(s) can be downloaded from the <https://www.ireps.gov.in> by the registered tenderers only. The details of registration and online tendering process is mentioned in Para 1.3.1 (iii) above.

1.3.4.2 Clause applicable for tender documents downloaded from Internet

Tenderer/s is/are free to download tender documents at their own cost, for the purpose of perusal. Master copy of the tender document will be available in the office. 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 Employer's 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

For submitting the tender, the Tender documents and Amendment(s), if any, is/are available on <https://www.ireps.gov.in> and www.dfcc.com and the same can be downloaded and used as tender documents for submitting the offer. The cost of the tender document is indicated in NIT.

The cost of the tender document shall be deposited through payment gateway provided on <http://www.ireps.gov.in> on or before schedule date and time of submission of Bid. The proof of submission of cost of tender document should be uploaded along with the Technical Bid.

1.3.4.4 Complete tender documents must be submitted online duly completed in all respect **upto the scheduled date and time mentioned in the Para 1.1.1 of Notice Inviting E-Tender.** The **"Packet-A (TECHNICAL BID)"** will be opened on the scheduled day and time 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. Any modified date and time for submission of tenders shall be uploaded on DFCCIL website **www.dfccil.com** and **<https://www.ireps.gov.in>**. The detailed procedure of tender opening will be as per para1.3.5.

1.3.4.5 Financial Bid shall be filled directly on the website <https://www.ireps.gov.in> through digital signature and not to be submitted in hard copy at all. ***The financial bid should neither be scanned & uploaded, nor, the hard copy of the same*** should be submitted to the office of Employer.

1.3.4.6 The rates should be quoted in figures as well as in words. If there is variation between rates quoted in figures and in words, the rate quoted in 'words' shall be taken as correct. If more than one or improper rates are tendered for the same item, the tender is liable to be rejected.

1.3.4.7 Each page of the tender papers is to be signed either physically or digitally by the tenderers or such person/s on his/their behalf that is/are legally authorized to sign for him / them.

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) Tenders 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. Tenders will ensure that full benefit of Input Tax (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, the DFCCIL shall deduct the applicable GST from his/their bills under reverse charge mechanism (RCM) and deposit the same to the concerned authority.

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. Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.

1.3.4.10 The bid submitted / received after the time and date fixed for receipt of Bids as set out in the documents are liable to be rejected.

1.3.4.11 Conditional tenders are liable to be rejected straightway. DFCCIL reserves the right to reject such tenders summarily without assigning any reasons whatsoever. In case tenderer/s still decides to have conditional offer, all such conditions are required to be listed separately and shall be supplemented by the details of exact financial implications, if applicable. DFCCIL will not take cognizance of any other conditions / variations from the tender stipulations mentioned at any other place in the tender documents.

1.3.4.12 The bidder shall submit only one bid in the capacity of an individual or sole proprietor, partnership firm or company. Violation of this condition is liable to disqualify the tender in which bidder has participated and EMD of all such tenderers shall stand forfeited.

1.3.4.13 Withdrawal of Tender: No tender can be withdrawn after scheduled date and time of submission and during tender validity period.

1.3.5 Opening of Tender:

- (a) Tender will be opened at the scheduled date and time mentioned in the Para 1.1.1 of Notice Inviting E-Tender in the office of Employer's in the presence of the tenderers or their representatives as may be present at

Tender document no EDFC_CGM_TDL_ROB_5C
the prescribed date and time.

- (b) Bid of the bidders shall be opened through process of e-tendering. The sequence of opening shall be:
 - i) Technical offer- Technical Bid (Packet-A)
 - ii) Financial offer- (On a later date after scrutiny/evaluation of Technical Bid)
- (c) **'TECHNICAL BID (Packet- A)** only of all the tenderers shall be opened and the contents there of i.e. qualification details shall be read out.
- (d) 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 shortlisted.
- (e) 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 shortlisted 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 and these shall be returned by the employer. 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 after 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/ Registered Society /Registered Trust / Hindu Undivided Family (HUF) / Limited Liability Partnership (LLP) etc. The tenderer(s) shall enclose the attested copies of the constitution of their concern and copy of PAN Card along with their tender. Tender Documents in such cases are to be signed by such persons as may be legally competent to sign them on behalf of the firm, company, association, trust or society, as the case may be.

1.3.6.2 The tenderer shall give full details of the constitution of the Firm / JV / Company/ Registered Society /Registered Trust / Hindu Undivided Family (HUF) / Limited Liability Partnership (LLP) 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. (iii) An undertaking by all partners of the partnership firm that they are not blacklisted or debarred by Railways or any other Ministry / Department of the Govt. of India from participation in tenders / contracts as on the date of submission of bids, either in their individual capacity or in any firm/LLP in which they were / are partners/members. Any Concealment / wrong information in regard to above shall make the bid ineligible or the contract shall be determined under Clause 62 of the Standard General Conditions of Contract.

- (c) Joint Venture: The tenderer shall submit documents as mentioned in Clause 65 to GCC.
- (d) Companies registered under Companies Act-1956/2013: The tenderer shall submit (i) the copies of Memorandum of Association (MOA)/ 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 favor of the individual, signing the tender on behalf of company (iii) A copy of Certificate of Incorporation.
- (e) HUF: A copy of notarized affidavit on Stamp Paper declaring that he who is submitting the tender on behalf of HUF is in the position of 'Karta' of Hindu Undivided Family (HUF) and he has the authority, power and consent given by other members to act on behalf of HUF.
- (f) LLP (Limited Liability Partnership):
 - (i) A copy of LLP Agreement
 - (ii) A copy of Certificate of Incorporation
 - (iii) A copy of Power of Attorney/Authorization issued by the LLP in favour of the individual to sign the tender on behalf of the LLP and create liability against the LLP.
 - (iv) An undertaking by all partners of the LLP that they are not blacklisted or debarred by Railways or any other Ministry / Department of the Govt. of India from participation in tenders / contracts as on the date of submission of bids, either in their individual capacity or in any firm/LLP or JV in which they were / are partners/members. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the Standard General Conditions of Contract.
- (g) Registered Society & Registered Trust:
 - (i) A copy of Certificate of Registration
 - (ii) A copy of Memorandum of Association of Society/Trust Deed
 - (iii) A copy of Power of Attorney in favour of the individual to sign the tender documents and create liability against the Society/Trust.
 - (iv) A copy of Rules & Regulations of the Society

- 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** A tender from Joint Venture / Partnership Firm etc. shall be considered only where permissible as per the tender conditions.

- 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 Technical Bid 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, CGM/Tundla**' deposited in any of the forms as mentioned in Sub-Para 1.3.8(c) below, failing which the tender will not be considered. Any firm recognized by Department of Industrial Policy and Promotion (DIPP) as 'Startups' shall be exempted from payment of the Earnest Money. Labour Cooperative Societies shall submit only 50% of the Earnest Money.
- (b) The earnest money shall remain deposited with the DFCCIL for the period of validity of the offer prescribed in this tender i.e. 120 days from the date of opening of tender. In case of EMD being submitted in form of Bank Guarantees, the Bank Guarantee shall remain valid for 90 days beyond the validity of the bid. If the validity of the offer is extended, the validity of earnest money should also be extended failing which the offer after the expiry of the aforesaid period may not be considered by the DFCCIL. The proof of submission of EMD should be uploaded along with the Technical Bid.

- (c) The Earnest money should be in **any** of the following forms:
- (i) The Earnest Money (Bid Security) shall be deposited either in cash through e-payment gateway on <https://www.ireps.gov.in>.

Or,

- (ii) Bank Guarantee on format from Nationalised/Indian Scheduled Commercial Bank. Bank guarantees shall remain valid for 90 days beyond the validity of the bid. Sample format for Bank Guarantee for EMD is enclosed as Form No. 24 (Part-IV, Chapter-II of Bid Document).

In case, submission of Bid Security in the form of Bank Guarantee, following shall be ensured:

- (a) A scanned copy of the Bank Guarantee shall be uploaded on e-Procurement Portal (<https://www.ireps.gov.in>) while applying to the tender.
- (b) The original Bank Guarantee should be delivered in person to the official nominated as indicated in the tender document before the scheduled time and date of submission of bids.
- (c) Non submission of scanned copy of Bank Guarantee with the bid on e-tendering portal (<https://www.ireps.gov.in>) and/or non submission of original Bank Guarantee within the specified period shall lead to summary rejection of bid.
- (d) The Tender Security shall remain valid for a period of 90 days beyond the validity period for the Tender.
- (d) It shall be understood that the tender documents have been sold/issued to the tenderer and the tenderer is permitted to tender in consideration of stipulation on his part, that after submitting his tender he will not resale from his offer or modify the terms and conditions, thereof in a manner not acceptable to the Employer. Should the tenderer fail to observe or comply with the said stipulation, the aforesaid amount shall be liable to be forfeited by the DFCCIL.
- (e) The original instruments of Earnest Money (Bank Guarantee - in original) have to be submitted to Employer's office before the scheduled date and time of submission of the tender otherwise the Bid may not be considered.
- (f) The earnest money of the unsuccessful tenderer(s) will, save as here- in- before provided, be returned to the unsuccessful tenderer(s) within a reasonable time but the DFCCIL shall not be responsible for any loss or depreciation that may happen for the due performance of the stipulation to keep the offer open for the period specified in the tender documents or to the earnest money while in their possession or be liable to pay interest there on.

NOTE: No interest shall be paid by DFCCIL on earnest money amount.

1.3.9 Execution of Contract Agreement: -

The successful tenderer, whose tender has been accepted by the competent authority of DFCCIL, will be informed by the DFCCIL through a Letter of Acceptance (LoA). Letter of Acceptance after it is signed by the Contractor in token of his acceptance shall constitute a legal and binding contract between DFCCIL and the contractor till such time the contract agreement is signed.

The Tenderer whose tender is accepted shall be required to appear in person at the Employer's office 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 has been awarded to him. 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 legibly and clearly. Any communication sent in time, to the tenderer by post at his said address shall be deemed to have reached the tenderer duly and in time. Important documents should be sent by registered post.

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	
Requirement	
I	<p>The tenderer /JV firm or Lead Member of JV firm must have satisfactorily completed or substantially completed any one of the following categories of work(s) during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:</p> <p>(i) Three similar works each costing not less than the amount equal to 30% of advertised value of the tender excluding structural steel component of the advertised tender, or</p> <p>(ii) Two similar works each costing not less than the amount equal to 40% of advertised value of the tender excluding structural steel component of the advertised tender, or</p> <p>(iii) One similar work costing not less than the amount equal to 60% of advertised value of the tender excluding structural steel component of the advertised tender.</p> <p style="text-align: center;">AND</p>
II	<p>The tenderer /JV firm or any Member of JV firm must have satisfactorily completed work of component of supply, fabrication and erection of open web/ BOW String girder for Railway / Metro Railway/ Road Bridge over Railway lines in any one of the following categories of works during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:</p> <p>(i) Three similar works each costing not less than the amount equal to 30% value of structural steel component of the advertised tender , or</p> <p>(ii) Two similar works each costing not less than the amount equal to 40% value of structural steel component of the advertised tender , or</p> <p>(iii) One similar work costing not less than the amount equal to 60% value of structural steel component of the advertised tender.</p> <p>Note:</p> <p>1. The single work having component of fabrication, erection and launching of Open Web / /Bow String Girder for Railway/Metro Railway/ Road Bridge can be a separate work OR same as I above, in which case value of component of supply, fabrication and erection of plate steel girder is to be bifurcated clearly so as to fulfil both the qualifying amount of Rs.110247471.54 (I above) + Rs.73033462.74 (II above) i.e. Total of single completed work value = Rs.66148483 (I above) + Rs.43820078 (II above) (60% of the advertised tender value)/ two completed works value= Rs.44098989 (I above) + Rs.29213385 (II above) (40%+40% of the advertised tender value)/ three completed works value= Rs.33074241 (I above) + Rs.21910039 (II above) (30% +30% +30% of the advertised tender value)</p> <p>2. The value of completed works includes value of the structural steel also, if supplied by the tenderer in the completed work.</p> <p>3. For Technical Eligibility Criterion (i) A(II), completion of fabrication, erection and launching of steel bridge span work, not necessarily the entire contract work, is essential.</p>

Note:

(a) **Similar Nature of Work** for this Tender is defined as:

1. Construction of Railway Bridge, having at least one span of 12.2 mtr or more of open web girder/Bow string on pile or well foundation.
- (b) *It is clarified that Road Under Bridge of box type shall not be considered as Railway bridge/ viaduct of railway/bridge of metro/viaduct of metro and shall not be considered as similar nature of work for this tender.
- (c) For the purpose of technical eligibility criteria, the definition of ROB means "Road Over Bridges" constructed over Railway line(s).
- (d) It is clarified that the Technical Eligibility Criterion mentioned above is with composite component for fulfilment of criteria by a JV firm. Refer Clause 65.15.1 of Chapter IV Part I of this Tender document.

(B) : Financial Eligibility Criteria

Criteria
Requirement
<p>The tenderer must have minimum average annual contractual turnover of V/N or V whichever is less; where,</p> <p>V= Advertised value of the tender in crores of Rupees</p> <p>N= Number of years prescribed for completion of work for which bids have been invited.</p> <p>The average annual contractual turnover shall be calculated as an average of "total contractual payments" in the previous three financial years, as per the audited balance sheet. However, in case balance sheet of the previous year is yet to be prepared/ audited, the audited balance sheet of the fourth previous year shall be considered for calculating average annual contractual turnover.</p> <p>The tenderers shall submit requisite information as per Form 2B, along with copies of Audited Balance Sheets duly certified by the Chartered Accountant/ Certificate from Chartered Accountant duly supported by Audited Balance Sheet.</p>

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.

(C) Bid Capacity

For tenders having advertised value more than Rs 20 crore wherein eligibility criteria includes bid capacity also, the tenderer will be qualified only if its available bid capacity is equal to or more than the total bid value of the present tender. The available bid capacity shall be calculated as under:

Available Bid Capacity = $[A \times N \times 2] - 0.33 \times N \times B$ Where,

A = Maximum value of construction works executed and payment received in any one of the previous three financial years or the current financial year (up to date of inviting tender), taking into account the completed as well as works in progress.

N= Number of years prescribed for completion of work for which bids has been invited.

B = existing commitments and balance amount of ongoing works with the tenderer as per Form No. 2C for statement of all works in progress and also the works which are awarded to tenderer but yet not started up to the date of inviting of tender.

Note:

- (a) The Tenderer(s) shall furnish the details of -
- (i) Maximum value of construction works executed and payment received in any one of the previous three financial years or the current financial year (up to date of inviting tender) for calculating A, and
 - (ii) Existing commitments and balance amount of ongoing works with tenderer as per Form No. 2C for statement of all works in progress and also the works which are awarded to tenderer but yet not started up to the date of inviting of tender for calculating B. In case of no works in hand, a 'NIL' statement should be furnished.

The submitted details for (i) and (ii) above should be duly verified by Chartered Accountant.

- (b) In case if a bidder is JV, the tenderer(s) must furnish the details of
- (i) Maximum value of construction works executed and payment received in any one of the previous three financial years or the current financial year (up to date of inviting tender) by each member of JV for calculating A, and
 - (ii) Existing commitments and balance amount of ongoing works with each member of JV either in individual capacity or as a member of other JV as per the Form No. 2C for statement of all works in progress and also the works which are awarded to each member of JV either in individual capacity or as a member of other JV but yet not started up to the date of inviting of tender for calculating B. In case of no works in hand, a 'NIL' statement should be furnished.

The submitted details for (i) and (ii) above should be duly verified by Chartered Accountant.

- (c) Value of a completed work/work in progress/work awarded but yet not started for a Member in an earlier JV shall be reckoned only to the extent of the concerned member's share in that JV for the purpose of satisfying his/her compliance to the above mentioned bid capacity in the tender under consideration.
- (d) The arithmetic sum of individual "bid capacity" of all the members shall be taken as JV's "bid capacity".
- (e) In case, the tenderer/s failed to submit the above statement along with offer, their/his offer shall be considered as incomplete and will be rejected **summarily**.
- (f) The available bid capacity of tenderer shall be assessed based on the details submitted by the tenderer. In case, the available bid capacity is lesser than estimated cost of work put to tender, his offer shall not be considered even if he has been found eligible in other eligibility criteria/tender requirement.

The tender/technical bid will be evaluated based on details submitted in Form No. 2C.

Explanatory Notes for Clause 1.3.13 (i) -Eligibility Criteria:

1. *Substantially Completed Work means an ongoing work in which payment equal to or more than 90% of the present contract value (excluding the payment made for adjustment of Price variation (PVC), if any) has been made to the contractor in that ongoing contract and no proceedings of termination of contract on Contractor's default has been initiated. The credential certificate in this regard should have been issued not prior to 60 days of date of invitation of present tender.*
2. *In case a work is started prior to 07 (seven) years, ending last day of month previous to the one in which tender is invited, but completed in last 07 (seven) years, ending last day of month previous to the one in which tender is invited, the completed work shall be considered for fulfillment of credentials.*

3. If a work is physically completed and completion certificate to this extent is issued by the concerned organization but final bill is pending, such work shall be considered for fulfillment of credentials
4. In case of completed work, the value of final bill (gross amount) including the PVC amount (if paid) shall be considered as the completion cost of work. In case final bill is pending, only the total gross amount already paid including the PVC amount (if paid) shall be considered as the completion cost of work.

In case of substantially completed work, the total gross amount already paid including the PVC amount (if paid), as mentioned in the certificate, shall be considered as the cost of substantially completed work.

5. If a bidder has successfully completed a work as subcontractor and the work experience certificate has been issued for such work to the subcontractor by a Govt. Organization or public listed company as defined in Note for Item 10.1 Para 10 of the Tender Form (Second Sheet), the same shall be considered for the purpose of fulfillment of credentials.
6. In case a work is considered similar in nature for fulfillment of technical credentials, the overall cost including the PVC amount (if paid) of that completed work or substantially completed work, shall be considered and no separate evaluation for each component of that work shall be made to decide eligibility.
7. In case of newly formed partnership firm, the credentials of individual partners from previous propriety firm(s) or dissolved previous partnership firm(s) or split previous partnership firm(s), shall be considered only to the extent of their share in previous entity on the date of dissolution / split and their share in newly formed partnership firm. For example, a partner A had 30% share in previous entity and his share in present partnership firm is 20%. In the present tender under consideration, the credentials of partner A will be considered to the extent of 0.3×0.2 * value of the work done in the previous entity. For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deed(s), dissolution deed(s) and proof of surrender of PAN No.(s) in case of dissolution of partnership firm(s) etc.
8. In case of existing partnership firm, if any one or more partners quit the partnership firm, the credentials of remaining partnership firm shall be re-worked out i.e., the quitting partner(s) shall take away his credentials to the extent of his share on the date of quitting the partnership firm(e.g. in a partnership firm of partners A, B & C having share 30%, 30% & 40% respectively and credentials of Rs 10 crore; in case partner C quits the firm, the credentials of this partnership firm shall remain as Rs 6 crore). For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deed(s), dissolution deed(s) and proof of surrender of PAN No.(s) in case of dissolution of partnership firm(s) etc.
9. In case of existing partnership firm if any new partner(s) joins the firm without any modification in the name and PAN/TAN no. of the firm, the credentials of partnership firm shall get enhanced to the extent of credentials of newly added partner(s) on the same principles as mentioned in item 6 above. For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deeds, dissolution/splitting deeds and proof of surrender of PAN No.(s) in case of dissolution of partnership firm etc.
10. Any partner in a partnership firm cannot use or claim his credentials in any other firm without leaving the partnership firm i.e., In a partnership firm of A&B partners, A or B

partner cannot use credentials of partnership firm of A&B partners in any other partnership firm or propriety firm without leaving partnership firm of A&B partners.

11. In case a partner in a partnership firm is replaced due to succession as per succession law, the proportion of credentials of the previous partner will be passed on to the successor.
12. If the percentage share among partners of a partnership firm is changed, but the partners remain the same, the credentials of the firm before such modification in the share will continue to be considered for the firm as it is without any change in their value. Further, in case a partner of partnership firm retires without taking away any credentials from the firm, the credentials of partnership firm shall remain the same as it is without any change in their value.
13. In a partnership firm "AB" of A&B partners, in case A also works as propriety firm "P" or partner in some other partnership firm "AX", credentials of A in propriety firm "P" or in other partnership firm "AX" earned after the date of becoming a partner of the firm AB shall not be added in partnership firm AB.
14. In case a tenderer is LLP, the credentials of tenderer shall be worked out on above lines similar to a partnership firm.
15. In case company A is merged with company B, then company B would get the credentials of company A also.

(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) For Bid Capacity, the details will be submitted in Form No. 2C along with supporting documents.
- (d) Work experience certificate from private individual shall not be considered. However, in addition to work experience certificates issued by any Govt. Organization, work experience certificate issued by Public listed company having average annual turnover of Rs 500 crore and above in last 3 financial years excluding the current financial year, listed on National Stock Exchange or Bombay Stock Exchange, incorporated/registered at least 5 years prior to the date of closing of tender, shall also be considered provided the work experience certificate has been issued by a person authorized by the Public listed company to issue such certificates.

In case tenderer submits work experience certificate issued by public listed company, the tenderer shall also submit along with work experience certificate, the relevant copy of work order, bill of quantities, bill wise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by company in support of above work experience certificate.

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 and organizational resources, 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 there on 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 or DFCCIL 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) Credentials if submitted in foreign currency shall be converted into Indian currency i.e., Indian Rupee as under:

The conversion rate of US Dollars into Rupees shall be the daily representative exchange rates published by the Reserve Bank of India or entity authorized by RBI to do so for the relevant date or immediately previous date for which rates have been published. Where, relevant date shall be as on the last day of month previous to the one in which tender is invited. In case of any other currency, the same shall first be converted to US Dollars as on the last day of month previous to the one in which tender is invited, and the amount so derived in US Dollars shall be converted into Rupees at the aforesaid rate. The conversion rate of such currencies shall be the daily representative exchange rates published by the International Monetary Fund for the relevant date or immediately previous date for which rates have been published.

- (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.

1.3.13 (iii) System of Verification of Tenderer's Credential:

1. For the works tenders, it has been decided to adopt the affidavit-based system of credential verification. 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).
2. The tenderers shall submit a notarized affidavit on a non-judicial stamp paper stating that they are not liable to be disqualified and all their statements/documents submitted along with bid are true and factual. Standard format of the affidavit to be submitted on IREPS portal by the bidder is enclosed as **Form-22**. Non submission of an affidavit by the bidder shall result in summary rejection of his/their bid. And it shall be mandatorily incumbent upon the tenderer to identify, state and submit the supporting documents duly self-attested by which they/he is qualifying the Qualifying Criteria mentioned in the Tender Document. It will not be obligatory on the part of Tender Committee to scrutinize beyond the submitted document of tenderer as far as his qualification for the tender is concerned.
3. 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.
4. In case of any wrong information submitted by tenderer, the contract shall be terminated, Earnest Money Deposit (EMD), Performance (PG) and Security Deposit (SD) of contract forfeited and agency barred for doing business on entire DFCCIL for 5(five) years.

1.3.14 Period of Completion

The entire work is required to be completed in all respects within **08 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 Pre-Bid Meeting-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 (a) Provisions of Make in India Policy 2017 issued by Govt. of India, as amended from time to time, shall be followed for consideration of tenders.

The Bidder must indicate the percentage of local content as stipulated in Public Procurement (preference to Make in India), order 2017 as amended from time to time and its subsequent orders/ notification issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as class I local supplier is 50% and to qualify as Class II local supplier would be 20%. Non local suppliers are not eligible to participate as per provisions of the public Procurement (Preference to Make In India), Order 2017 and its subsequent amendment. The bidder shall be required to upload a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or by a practicing cost accountant or practicing chartered accountant (if bidder is other than companies), giving the percentage of local content. Preference shall be given to class I local suppliers as per provisions of the Public Procurement (Preference to Make in India), order 2017 and its subsequent amendments.

(b) Permission to Bid for a bidder from a country which shares Land boundary with India:

Any bidder from the countries sharing a land border with India will be eligible to bid in any procurement of works (including turnkey projects) only if the bidder is registered with the Competent Authority. The Competent Authority for registration will be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT), Government of India. For interpretation of this para, Department of Expenditure, Ministry of Finance, Government of India letter F.No.6/18/2019-PPD dated 23/07/2020 shall be referred.

1.3.18 Quantum of work and materials:

The indicative schedule of quantities of various items of works is included in Form – 3 and 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

1.3.20 Schedule of Prices

The Form-3 and Form-4 of Part-IV, Chapter-II of BID DOCUMENTS 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 equipment 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 Preliminary examination of bids

- a) The DFCCIL shall examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed and whether the bids are generally in order.
- b) Arithmetical errors shall be rectified on the following basis if found. If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity, or between subtotals and the total price, the unit or subtotal price shall prevail, and the total price shall be corrected.
- c) The rates should be quoted in figures as well as in words. If there is variation between rates quoted in figures and in words, the rate quoted in 'words' shall be taken as correct. If more than one or improper rates are tendered for the same item, the tender is liable to be rejected.
- d) Prior to the detailed evaluation, DFCCIL shall determine whether each bid is

of acceptable quality, is generally complete and is substantially responsive to the bidding documents. For purposes of this determination, a substantially responsive bid is one that conforms to all the terms, conditions and specifications of the bidding documents without material deviations, objections, conditionality or reservation. A material deviation, objections, conditionality or reservation is one:

- (i) That affects in any substantial way the scope, quality or Performance of the contract.
 - (ii) That limits in any substantial way, inconsistent with the bidding documents, the DFCCIL's rights or the successful Bidder's obligations under the contracts; or
 - (iii) Whose rectification would unfairly affect the competitive position of other Bidders who are presenting substantially responsive bids.
- e) If a bid is not substantially responsive, it shall be rejected by the DFCCIL.
 - f) In case of tenders containing any conditions or deviations or reservations about contents of tender document. DFCCIL can summarily reject such tender.
 - g) **Clarification of Bids:** To assist in the examination, evaluation & comparison and prequalification of the Tender, the DFCCIL may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the DFCCIL shall not be entertained or considered. The DFCCIL request for clarification and the response of the bidder in this regard shall be in writing.

1.3.27 Evaluation and comparison of tenders

In case of open tenders, bids, which are determined as substantially responsive, shall be evaluated based on criteria as given in Eligibility Criteria" and as given in Notice Inviting E- Tender. The tenderer must submit all necessary authentic data with necessary supporting certificates of the various items of evaluation criteria failing which his tender is liable to be rejected.

1.3.28 Canvassing

No tenderer is permitted to canvass to DFCCIL on any matter relating to this tender. Any tenderer found doing so may be disqualified and his bid may be rejected.

1.3.29 Award of Contract

1. DFCCIL shall notify the successful tenderer in writing by a Registered Letter/Courier/Speed Post or through bearer that his tender has been accepted.
2. Letter of Acceptance after it is signed by the Contractor in token of his acceptance shall constitute a legal and binding contract between DFCCIL and the contractor till such time the contract agreement is signed.

1.3.30 Understanding and Amendments of Tender Documents:

1. The bidder must own all responsibilities and bear all cost for obtaining all the information including risks, contingencies & other circumstances in execution of the work. It shall also carefully read and understand all its obligations & liabilities given

in tender documents.

2. The bidder is advised to visit and examine the site where the work is to be executed and its surroundings or other areas as deemed fit by the bidder and should obtain at his own cost all information that may be necessary for preparing the bid and execution of the contract. The cost of visiting the site and collecting relevant data shall be at the bidder's own expenses. It is a condition of the tender that the tenderer is deemed to have visited the site and satisfied himself with all the conditions prevailing including any difficulties for executing the work.
3. At any time prior to the deadline for submission of bids, DFCCIL may for any reason whether at its own initiative or in response to any request by any prospective bidder amend the bidding documents by issuing Amendment, which shall be part of the Tender documents.
4. DFCCIL may at its discretion extend the deadline for submission of the bids at any time before the time of submission of the bids.

1.3.31 Provision for medium & small enterprises (MSE):

As mandated by Railway Board Letter No. 2010/RS (G)/363/1 dated 05.07.2012 (RBS No. 4/2012), in compliance to public procurement policy, following provisions are included for Medium & Small Enterprises (MSE) in the tender document:

1. Tender sets shall be provided free of cost to MSEs registered with the listed agencies for the item tendered.
2. MSEs registered with the listed agencies for the item tendered will be exempted from payment of Earnest Money.
3. (I) MSEs who are interested in availing themselves of these benefits will enclose with their offer the proof of their being MSE registered with any of the agencies mentioned in the notification of Ministry of MSME indicated below:

- (i) District industries Centers
- (ii) Khadi and Village Industries Commission
- (iii) Khadi and Village Industries Board
- (iv) Coir Board
- (v) National Small Industries Corporation
- (vi) Directorate of Handicraft and Handloom
- (vii) Any other body specified by Ministry of MSME.

(II) The MSEs must also indicate the terminal validity date of their registration.

Falling (I) & (II) above, such offers will not be liable for consideration of benefits detailed in MSE notification of Government of India dated 23.03.2012.

4. Definition of MSEs owned by SC/ST is as give below:
 - (i) In case of proprietary MSE, proprietors (s) shall be SC/ST.
 - (ii) In case of partnership MSE, the SC/ST partners shall be holding at least 51% shares in the unit.

- (iii) In case of Private Limited Companies at least 51% share shall be held by SC/ST promoters.
5. All bidders registered under Micro, Small and Medium Enterprises (MSMEs) shall have to satisfy the eligibility criteria at par with other bidders. There shall not be any relaxation in eligibility criteria/tender process or other tender requirements and L-1 price.
6. ***The above facilities shall not be applicable for the items for which they are not registered.***
7. The tenderer (s) shall submit copy of current and valid MSMEs registration certificate inclusive of all the pages showing the category of entrepreneur – whether the registered firm is owned by General or SC/ST entrepreneurs, monetary limit of their registration for the items tendered to avail the benefits under the policy. The MSMEs shall also submit a copy of “Entrepreneur’s Memorandum (Part-II)” of the concerned district centre where the unit is established.
8. **Registration of Udyog Aadhar Memorandum (UAM):** All Micro, Small and Medium Enterprises (MSMEs) bidders are required to declare UAM Number on CPPP / <https://www.ireps.gov.in> failing which such bidders will not be able to enjoy the benefits as per Public Procurement Policy for tenders invited electronically through CPPP / <https://www.ireps.gov.in>.

1.3.32 JOINT VENTURE (JV) FIRMS IN WORKS TENDERS:

1.3.32.0 Participation of Joint Venture (JV) in Works Tender: This para shall be applicable for works tenders wherein tender documents provide for the same.

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

1.3.32.2 Number of members in a JV shall not be more than three, if the work involves only one department (say Civil or S&T or Electrical or Mechanical) and shall not be more than five, if the work involves more than one Department. One of the members of the JV shall be its Lead Member who shall have a majority (at least 51%) share of interest in the JV. The other members shall have a share of not less than 20% each in case of JV with upto three members and not less than 10% each in case of JV with more than three members. In case of JV with foreign member(s), the Lead Member has to be an Indian firm/company with a minimum share of 51%.

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

1.3.32.4 The tender form shall be purchased and submitted only in the name of the JV and not in the name of any constituent member. The tender form can however be submitted by JV or any of its constituent member or any person authorized by JV through Power of Attorney to submit tender.

1.3.32.5 Bid Security Deposit shall be submitted by JV or authorized person of JV either as :

- (i) Cash through e-payment gateway or as mentioned in tender document, or
- (ii) Bank Guarantee bond either in the name of JV, or in the name of all members of JV as per MOU irrespective of their share in the JV if the JV has not been constituted legally till the date of submission of tender.

1.3.32.6 A copy of Memorandum of Understanding (MoU) duly executed by the JV members on a

stamp paper, shall be submitted by the JV along with the tender. The complete details of the members of the JV, their share and responsibility in the JV etc. particularly with reference to financial, technical and other obligations shall be furnished in the MoU.

- 1.3.32.7** Once the tender is submitted, the MoU shall not normally be modified / altered / terminated during the validity of the tender. In case the tenderer fails to observe/comply with this stipulation, the full Bid Security shall be liable to be forfeited.
- 1.3.32.8** Approval for change of constitution of JV shall be at the sole discretion of the DFCCIL. The constitution of the JV shall not normally be allowed to be modified after submission of the bid by the JV, except when modification becomes inevitable due to succession laws etc., provided further that there is no change in qualification of minimum eligibility criteria by JV after change of composition. However, the Lead Member shall continue to be the Lead Member of the JV. Failure to observe this requirement would render the offer invalid.
- 1.3.32.9** Similarly, after the contract is awarded, the constitution of JV shall not be normally allowed to be altered during the currency of contract except when modification become inevitable due to succession laws etc. and 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.
- 1.3.32.10** On award of contract to a JV, a single Performance Guarantee shall be submitted by the JV 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 and no splitting of guarantees amongst the members of the JV shall be permitted.
- 1.3.32.11** On issue of LOA (Letter of Acceptance), the JV entity to whom the work has been awarded, with the same shareholding pattern as was declared in the MOU/JV Agreement submitted alongwith the tender, shall be got registered before the Registrar of the Companies under 'The Companies Act - 2013' (in case JV entity is to be registered as Company) or before the Registrar/Sub-Registrar under the 'The Indian Partnership Act, 1932' (in case JV entity is to be registered as Partnership Firm) or under 'The LLP Act 2008' (in case JV entity is to be registered as LLP). A separate PAN shall be obtained for this entity. The documents pertaining to this entity including its PAN shall be furnished to the DFCCIL before signing the contract agreement for the work. In case the tenderer fails to observe/comply with this stipulation within 60 days of issue of LOA, contract is liable to be terminated. In case contract is terminated DFCCIL shall be entitled to forfeit the full amount of the Bid Security and other dues payable to the Contractor under this contract. The entity so registered, in the registered documents, shall have, inter-alia, following Clauses:
- 1.3.32.11.1** Joint and Several Liability - Members of the entity to which the contract is awarded, shall be jointly and severally liable to the DFCCIL for execution of the project in accordance with General and Special Conditions of Contract. The members of the entity shall also be liable jointly and severally for the loss, damages caused to the DFCCIL during the course of execution of the contract or due to non-execution of the contract or part thereof.
- 1.3.32.11.2** Duration of the Registered Entity - It shall be valid during the entire currency of the contract including the period of extension, if any and the maintenance period after the work is completed.
- 1.3.32.11.3** Governing Laws - The Registered Entity shall in all respect be governed by and interpreted in accordance with Indian Laws.
- 1.3.32.12** Authorized Member - Joint Venture members in the JV MoU shall authorize Lead member on behalf of the Joint Venture 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 document no EDFC_CGM_TDL_ROB_5C

tender/contract. All notices/correspondences with respect to the contract would be sent only to this authorized member of the JV.

1.3.32.13 No member of the Joint Venture 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 DFCCIL in respect of the said tender/contract.

1.3.32.14 Documents to be enclosed by the JV along with the tender:

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

- (i) A notarized copy of the Partnership Deed or a copy of the Partnership deed registered with the Registrar.
- (ii) A copy of consent of all the partners or individual authorized by partnership firm, to enter into the Joint Venture Agreement on a stamp paper,
- (iii) A notarized or registered copy of Power of Attorney in favour of the individual to sign the MOU/JV Agreement on behalf of the partnership firm and create liability against the firm.
- (iv) An undertaking by all partners of the partnership firm that they are not blacklisted or debarred by Railways or any other Ministry / Department of the Govt. of India /DFCCIL from participation in tenders / contracts as on the date of submission of bids, either in their individual capacity or in any firm/LLP in which they were / are partners/members. Any Concealment / wrong information in regard to above shall make the bid ineligible or the contract shall be determined under Clause 62 of the General Conditions of Contract.

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

- (i) A copy of notarized affidavit on Stamp Paper declaring that his Concern is a proprietary Concern and he is sole proprietor of the Concern OR he who is signing the affidavit on behalf of HUF is in the position of 'Karta' of Hindu Undivided Family (HUF) and he has the authority, power and consent given by other members to act on behalf of HUF.

1.3.32.14.3 In case one or more members of the JV is/are companies, the following documents shall be submitted:

- (i) A copy of resolutions of the Directors of the Company, permitting the company to enter into a JV agreement,
- (ii) The copies of MOA (Memorandum of Association) / AOA (Articles of Association) of the company
- (iii) A copy of Certificate of Incorporation
- (iv) A copy of Authorization/copy of Power of Attorney issued by the Company (backed by the resolution of Board of Directors) in favour of the individual, to sign the tender, sign MOU/JV Agreement on behalf of the company and create liability against the company

1.3.32.14.4 In case one or more members of the JV is/are LLP firm/s, the following documents shall be submitted:

- (i) A copy of LLP Agreement
- (ii) A copy of Certificate of Incorporation of LLP
- (iii) A copy of resolution passed by partners of LLP firm, permitting the Firm to enter into a JV agreement
- (iv) A copy of Authorization /copy of Power of Attorney issued by the LLP firm (backed by resolution passed by the Partners) in favour of the individual, to sign the tender and/or sign the MOU/ JV agreement on behalf of the LLP and create liability against the LLP.
- (v) An undertaking by all partners of the LLP that they are not blacklisted or debarred by Railways or any other Ministry / Department of the Govt. of India

/DFCCIL from participation in tenders / contracts as on the date of submission of bids, either in their individual capacity or in any firm/LLP or JV in which they were / are partners/members. Any Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.

1.3.32.14.5 In case one or more members of the JV is/are Society/s or Trust/s, the following documents shall be submitted:

- (i) A copy of Certificate of Registration
- (ii) A copy of Memorandum of Association of Society/Trust Deed
- (iii) A copy of Rules & Regulations of the Society
- (iv) A copy of Power of Attorney, in favour of the individual to sign the tender documents and create liability against the Society/Trust.

1.3.32.15 Credentials & Qualifying Criteria: Technical, financial eligibility and Bid capacity of the JV shall be adjudged based on satisfactory fulfillment of the following criteria:

1.3.32.15.1 Technical Eligibility Criteria ('a' or 'b' mentioned hereunder):

(a) For Works without composite components

The technical eligibility for the work as per para 1.3.13(i)(A)I of Chapter III Part I, shall be satisfied by either the 'JV in its own name & style' or 'Lead member of the JV'.

Each other (non-lead) member(s) of JV, who is/ are not satisfying the technical eligibility for the work as per para 1.3.13(i)(A)I of Chapter III Part I, shall have technical capacity of minimum 10% of the cost of work i.e., each non-lead member of JV member must have satisfactorily completed or substantially completed during last 07 (seven) years, ending last day of month previous to the one in which tender is invited, one similar single work for a minimum of 10% of advertised value of the tender.

(b) For works with composite components

The technical eligibility for major component of work as per para 1.3.13(i)(A)I of Chapter III Part I, shall be satisfied by either the 'JV in its own name & style' or 'Lead member of the JV' and technical eligibility for other component(s) of work as per para 1.3.13(i)(A)II of Chapter III Part I, shall be satisfied by either the 'JV in its own name & style' or 'any member of the JV'.

Each other (non-lead) member(s) of JV, who is/ are not satisfying the technical eligibility for any component of the work as per para 1.3.13(i)(A) of Chapter III Part I, shall have technical capacity of minimum 10% of the cost of any component of work mentioned in technical eligibility criteria. i.e., each other (non-lead) member of must have satisfactorily completed or substantially completed during last 07 (seven) years, ending last day of month previous to the one in which tender is invited, one similar single work for a minimum of 10% of cost of any component of work mentioned in technical eligibility criteria in para 1.3.13(i)(A)I or 1.3.13(i)(A)II.

Note for Para 65.15.1:

- a) *The Major component of the work for this purpose shall be the component of work having highest value. In cases where value of two or more component of work is same, any one work can be classified as Major component of work.*
- b) *Value of a completed work done by a Member in an earlier JV shall be reckoned only to the extent of the concerned member's share in that JV for the purpose of satisfying his/her compliance to the above mentioned technical eligibility criteria in the tender*

1.3.32.15.2 Financial Eligibility Criteria

The JV shall satisfy the requirement of “Financial Eligibility” mentioned at para 1.3.13(i)(B) of Chapter III Part I. The “financial capacity” of the lead member of JV shall not be less than 51% of the financial eligibility criteria mentioned at para 1.3.13(i)(B) of Chapter III Part I.

The arithmetic sum of individual “financial capacity” of all the members shall be taken as JV’s “financial capacity” to satisfy this requirement.

Note: Contractual payment received by a Member in an earlier JV shall be reckoned only to the extent of the concerned member’s share in that JV for the purpose of satisfying compliance of the above mentioned financial eligibility criteria in the tender under consideration.

1.3.32.15.3 Bid Capacity

The JV shall satisfy the requirement of “Bid Capacity” requirement mentioned at para 1.3.13(i)(C) of Chapter III Part I. The arithmetic sum of individual “Bid capacity” of all the members shall be taken as JV’s “Bid capacity” to satisfy this requirement.

1.3.33 Participation of Partnership Firms in works tenders:

- 1.3.33.1 The Partnership Firms participating in the tender should be legally valid under the provisions of the Indian Partnership Act.
- 1.3.33.2 The partnership firm should have been in existence or should have been formed prior to submission of tender. Partnership firm should have either been registered with the Registrar or the partnership deed should have been notarized as per the Indian Partnership Act, prior to submission of tender.
- 1.3.33.3 Separate identity / name should be given to the partnership firm. The partnership firm should have PAN / TAN number in its own name and PAN / TAN number in the name of any of the constituent partners shall not be considered. The valid constituents of the firm shall be called partners.
- 1.3.33.4 Once the tender has been submitted, the constitution of the firm shall not normally be allowed to be modified / altered / terminated during the validity of the tender as well as the currency of the contract except when modification becomes inevitable due to succession laws etc., in which case prior permission should be taken from DFCCIL and in any case the minimum eligibility criteria should not get vitiated. The re-constitution of firm in such cases should be followed by a notary certified Supplementary Deed. The approval for change of constitution of the firm, in any case, shall be at the sole discretion of the DFCCIL and the tenderer shall have no claims what-so-ever. Any change in the constitution of Partnership firm after submission of tender shall be with the consent of all partners and with the signatures of all partners as that in the Partnership Deed. Failure to observe this requirement shall render the offer invalid and full Bid Security shall be forfeited.

If any Partner/s withdraws from the firm after submission of the tender and before the award of the contract, the offer shall be rejected and Bid Security of the tenderer will be forfeited. If any new partner joins the firm after submission of tender but prior to award of contract, his / her credentials shall not qualify for consideration towards eligibility criteria either individually or in proportion to his share in the previous firm. In case the tenderer fails to inform DFCCIL beforehand about any such changes / modification in the constitution which is inevitable due to succession laws etc. and the contract is awarded to such firm, then it will be considered a breach of the contract conditions liable for determination of the contract under Clause 62 of the General Conditions of Contract.

- 1.3.33.5 A partner of the firm shall not be permitted to participate either in his individual capacity or as a partner of any other firm in the same tender.
- 1.3.33.6 The tender form shall be submitted only in the name of partnership firm. The Bid Security shall be submitted by partnership firm. The Bid Security submitted in the name of any individual partner or in the name of authorized partner(s) shall not be considered.
- 1.3.33.7 On issue of Letter of Acceptance (LOA) to the partnership firm, all the guarantees like Performance Guarantee, Guarantee for various Advances to the Contractor shall be submitted only in the name of the partnership firm and no splitting of guarantees among the partners shall be acceptable.
- 1.3.33.8 On issue of Letter of Acceptance (LOA), contract agreement with partnership firm shall be executed in the name of the firm only and not in the name of any individual partner
- 1.3.33.9 In case the Letter of Acceptance (LOA) is issued to a partnership firm, the following undertakings shall be furnished by all the partners through a notarized affidavit, before signing of contract agreement.
- (a) Joint and several liabilities:
The partners of the firm to which the Letter of Acceptance (LOA) is issued, shall be jointly and severally liable to the DFCCIL for execution of the contract in accordance with General and Special Conditions of the Contract. The partners shall also be liable jointly and severally for the loss, damages caused to the DFCCIL during the course of execution of the contract or due to non- execution of the contract or part thereof.
- (b) Duration of the partnership deed and partnership firm agreement:
The partnership deed/partnership firm agreement shall normally not be modified/altered/ terminated during the currency of contract and the maintenance period after the work is completed as contemplated in the conditions of the contract. Any change carried out by partners in the constitution of the firm without permission of DFCCIL, shall constitute a breach of the contract, liable for determination of the contract under Clause 62 of the General Conditions of Contract.
- (c) Governing laws:
The partnership firm agreement shall in all respect be governed by and interpreted in accordance with the Indian laws.
- (d) No partner of the firm shall have the right to assign or transfer the interest right or liability in the contract without the written consent of the other partner/s and that of the DFCCIL.
- 1.3.33.10 The tenderer shall clearly specify that the tender is submitted on behalf of a partnership firm. The following documents shall be submitted by the partnership firm, with the tender:
- (i) A notarized copy of the Partnership Deed or a copy of the Partnership deed registered with the Registrar.
- (ii) A notarized or registered copy of Power of Attorney in favour of the individual to tender for the work, sign the agreement etc. and create liability against the firm.
- (iii) An undertaking by all partners of the partnership firm that they are not blacklisted or debarred by Railways or any other Ministry / Department of the Govt. of India /DFCCIL from participation in tenders / contracts as on the date of submission of

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bids, either in their individual capacity or in any firm/LLP in which they were / are partners/members. Any Concealment / wrong information in regard to above shall make the bid ineligible or the contract shall be determined under Clause 62 of the General Conditions of Contract.

1.3.33.11 Evaluation of eligibility of a partnership firm:

Technical and financial eligibility of the firm shall be adjudged based on satisfactory fulfillment of the eligibility criteria laid down in para 1.3.13(i) of Chapter III Part I of the Tender document.

1.3.34 The DFCCIL has appointed 2 (two) independent external monitors for the purpose of monitoring the Bidding Process and execution of the Contract Agreement for compliance with the principles specified in the integrity pact enclosed as Form no. 20.

GENERAL CONDITIONS OF CONTRACT(GCC)

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) "DFCCIL"/ "Employer" shall mean Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a company incorporated under the companies Act, 1956 and having its office at Supreme Court Metro Station Building, Pragati Maidan, New Delhi 110001 which expression shall also include its legal successors and permitted assigns."
- (b) "Railway" shall mean the President of the Republic of India or the Administrative Officers of the Railway or of the Successor Railway authorized to deal with any matter which these presents are concerned on his behalf.
- (c) "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/ Director of DFCCIL;
- (d) "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 Group General Manager /Chief General Manager/ General Manager/Chief Project Manager of DFCCIL.
- (e) "Divisional Railway Manager" shall mean the Officer in-charge of a Division of the Railway and shall also mean any officer nominated by "Railway" and shall mean and include their successors of the successor Railway.
- (f) "Engineer" and Employer's Engineer shall mean the Chief Project Manager/Chief General Manager/ General Manager (Coordination) of DFCCIL or PMC appointed by DFCCIL.
- (g) "Engineer's Representative" shall mean the Assistant Engineer, Assistant Signal and Telecommunication Engineer and Assistant Electrical Engineer, APM / PM /Dy. CPM / Add. CPM of DFCCIL in direct charge of the work and shall include any Sr. Sec. / Sec / Jr. Engineer / Executive / Sr. Executive, APM/PM / Dy. CPM of DFCCIL of Civil Engineering / Signal & Telecommunication Engineering / Electrical Engineering Department appointed by DFCCIL and shall mean and include the Engineer's Representative of the PMC appointed by DFCCIL.
- (h) "Contractor" shall mean the Person / Firm / LLP/ Trust / Cooperative Society or Company whether incorporated or not who enters into the contract with the DFCCIL and shall include their executors, administrators, and successors and permitted

- (i) "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 Engineer.
- (j) "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.
- (k) "Works" shall mean the works to be executed in accordance with the contract.
- (l) "Specifications" shall mean the Specifications for materials and works referred / mentioned in tender documents.
- (m) "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.
- (n) "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.
- (o) "Temporary Works" shall mean all temporary works of every kind required for the execution completion and/or maintenance of the works.
- (p) "Site" shall mean the land 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 DFCCIL for the purpose of the Contract.
- (q) "Period of Maintenance" shall mean the defect liability period (DLP) from the date of completion of the works as certified by the Engineer.
- (r) "Bid" or "Tender", "Bidder" or "Tenderer" wherever appearing in this document shall have the same and interchangeable meaning.
- (s) Date of inviting tender shall be the date of publishing tender notice on IREPS website if tender is published on website or the date of publication in newspaper in case tender is not published on website.
- (t) "Bill of Quantities" shall mean Schedule of Item(s) included in the tender document along with respective quantities and rates, accepted by the DFCCIL.
- (u) Standard Schedule of Rates (SSOR) shall mean the schedule of Rates adopted by the Railway, which includes-

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- (i) "Unified Standard Schedule of Rates of the Railway (USSOR)" i.e. the Standard Schedule of Rates of the Railway issued under the authority of the Chief Engineer from time to time, updated with correction slips issued up to date of inviting tender or as otherwise specified in the tender documents;
- (ii) "Delhi Schedule Of Rates (DSR)" i.e. the Standard Schedule of Rates published by Director General/ Central Public Works Department, Government of India, New Delhi, as adopted and modified by the Railway under the authority of the Chief Engineer from time to time, updated with correction slips issued up to date of inviting tender or as otherwise specified in the tender documents.

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

GCC-2022, Part-II with advance correction slip issued before the date of inviting of tender will be applicable.

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:-

- (v) "DFCCIL"/ "Employer" shall mean Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a company incorporated under the companies Act, 1956 and having its office at Supreme Court Metro Station Building, Pragati Maidan, New Delhi 110001 which expression shall also include its legal successors and permitted assigns."
- (w) "Railway" shall mean the President of the Republic of India or the Administrative Officers of the Railway or of the Successor Railway authorized to deal with any matter which these presents are concerned on his behalf.
- (x) "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/ Director of DFCCIL;
- (y) "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 Group General Manager /Chief General Manager/ General Manager/Chief Project Manager of DFCCIL.
- (z) "Divisional Railway Manager" shall mean the Officer in-charge of a Division of the Railway and shall also mean any officer nominated by "Railway" and shall mean and include their successors of the successor Railway.
- (aa) "Engineer" and Employer's Engineer shall mean the Chief Project Manager/Chief General Manager/ General Manager (Coordination) of DFCCIL or PMC appointed by DFCCIL.
- (bb) "Engineer's Representative" shall mean the Assistant Engineer, Assistant Signal and Telecommunication Engineer and Assistant Electrical Engineer, APM / PM /Dy. CPM / Add. CPM of DFCCIL in direct charge of the work and shall include any Sr. Sec. / Sec / Jr. Engineer / Executive / Sr. Executive, APM/PM / Dy. CPM of DFCCIL of Civil Engineering / Signal & Telecommunication Engineering / Electrical Engineering Department appointed by DFCCIL and shall mean and include the Engineer's Representative of the PMC appointed by DFCCIL.
- (cc) "Contractor" shall mean the Person / Firm / LLP/ Trust / Cooperative Society or Company whether incorporated or not who enters into the contract with the DFCCIL and shall include their executors, administrators, and successors and permitted assigns.

- (dd) "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 Engineer.
- (ee) "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.
- (ff) "Works" shall mean the works to be executed in accordance with the contract.
- (gg) "Specifications" shall mean the Specifications for materials and works referred / mentioned in tender documents.
- (hh) "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.
- (ii) "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.
- (jj) "Temporary Works" shall mean all temporary works of every kind required for the execution completion and/or maintenance of the works.
- (kk) "Site" shall mean the land 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 DFCCIL for the purpose of the Contract.
- (ll) "Period of Maintenance" shall mean the defect liability period (DLP) from the date of completion of the works as certified by the Engineer.
- (mm) "Bid" or "Tender", "Bidder" or "Tenderer" wherever appearing in this document shall have the same and interchangeable meaning.
- (nn) Date of inviting tender shall be the date of publishing tender notice on IREPS website if tender is published on website or the date of publication in newspaper in case tender is not published on website.
- (oo) "Bill of Quantities" shall mean Schedule of Item(s) included in the tender document along with respective quantities and rates, accepted by the DFCCIL.
- (pp) Standard Schedule of Rates (SSOR) shall mean the schedule of Rates adopted by the Railway, which includes-
- (iii) "Unified Standard Schedule of Rates of the Railway (USSOR)" i.e. the Standard Schedule of Rates of the Railway issued under the authority of the Chief Engineer from time to time, updated with correction slips issued up to date of inviting tender or as otherwise specified in

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the tender documents;

- (iv) "Delhi Schedule Of Rates (DSR)" i.e. the Standard Schedule of Rates published by Director General/ Central Public Works Department, Government of India, New Delhi, as adopted and modified by the Railway under the authority of the Chief Engineer from time to time, updated with correction slips issued up to date of inviting tender or as otherwise specified in the tender documents.

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

GCC-2022, Part-II with advance correction slip issued before the date of inviting of tender will be applicable.

SPECIAL CONDITIONS OF CONTRACT(SCC)

PART - I
CHAPTER
V

SPECIAL CONDITIONS OF CONTRACT

- 1.5.1 This Tender shall be governed by Preamble & 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 28 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 /Launching of ROB. The contractor shall submit a Quality Assurance Plan for the superstructure. The contractor shall also ensure that the Employer's prescribed Quality Assurance Standards are rigidly followed for the construction of superstructure. If the superstructure of ROB & FOB is designed by RDSO / RITES, Quality Assurance Plan shall be in line with Quality Assurance plans approved by RDSO. These plans are to be approved from the IR/ DFCCIL.
- (b) The contractor shall ensure quality at all necessary points, whether at manufacturers' 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 Program according to approved instructions, drawings, specifications, etc.
- (d) The Launching scheme of Bow string girder shall be approved by Railway/DFCCIL before start of erection/launching of BOW string girder of ROB.
- (e) Fabrication of ROB will be inspected by DFCCIL's Engineer in Charge / RDSO

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representative as per approved QAP.

1.5.6 **Expenses of Employer' Representative**– All the expenses of Engineers representative shall be borne by the Employer 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 following:-

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) In coming 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 super visors 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 equipment without any extra cost.
- (c) Block period shall be counted from the time the TR-line is placed at the Contractors 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 /DFCCIL. 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, 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 DFCCIL 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 DFCCIL caused due to any careless working or otherwise of violation of the Terms and Conditions of the track 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 /DFCCIL Train operations, 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 or 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:- (CAR 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) Insurance against Injury to Persons and Damage to Property

The Contractor, as insuring Party, shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 1.5.12 (b) [*Insurance for Works and Contractor's Equipment*]) or to any person / animal (except persons insured under Sub-Clause 1.5.12 (c) [*Insurance for Contractor's Personnel*]), which may arise out of the Contractor's performance of the

Contract and occurring before the issue of the Performance Certificate.

This insurance shall be for a limit per occurrence of not less than the **Rs. 100 Lakh (Rs Hundred Lakh)**, with no limit on the number of occurrences.

The insurances specified in this Sub-Clause:

- a. shall be effected and maintained by the Contractor as insuring Party,
- b. shall be in the joint names of the Contractor and Employer,
- c. shall be extended to cover liability for all loss and damage to the Employer's property (except things insured under Sub-Clause 1.5.12 (b)) arising out of the Contractor's performance of the Contract

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Employer, the Contractor and Subcontractors (wherever applicable) as separately insured.

The Employer 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 any Sub-Contractor (whether applicable), other than death or injury resulting from any act or default of the Employer, his agents or employees. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages, costs, charges and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

(b) Insurance for Works and Contractor's Equipment

The Contractor, as insuring Party, shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the Date of Commencement, until the date of issue of the Taking-Over Certificate for the Works.

The Contractor shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations.

The Contractor shall insure the Contractor's Equipment for **not less than the full replacement value, including delivery to Site plus 15% of replacement cost**. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.

The insurances specified in this Sub-Clause:

- (a) shall be effected and maintained by the Contractor as insuring Party,
- (b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated between the Parties for the sole purpose of rectifying the loss or damage,

- (c) shall cover all loss and damage from any cause not listed as Employer's Risks,
- (d) shall also cover loss or damage to a part of the Works which is attributable to the use or occupation by the Employer of another part of the Works, and loss or damage from the

Employer's Risks, excluding (in each case) risks which are not insurable at commercially reasonable terms

- (e) may however exclude loss of, damage to, and reinstatement of:
 - (i) a part of the Works which is in a defective condition due to a defect in its design, Materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),
 - (ii) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design,
Materials or workmanship
 - (iii) a part of the Works which has been taken over by the Employer, except to the extent that the Contractor is liable for the loss or damage, and

(c) Insurance for Contractor's Personnel

The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

The Employer and the Engineer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

(d) Automobile Liability Insurance

The contractor shall effect and maintain an insurance covering use of all vehicle used by the contractor or its sub-contractors (whether or not owned by them) in connection with the design, construction, testing and commissioning of the facilities under the contract in accordance with statutory requirements.

(e) Professional Indemnity Insurance

- i. The Contractor shall provide evidence of professional indemnity insurance carried by its Designer for the Works. The professional indemnity insurance shall cover the risk of professional negligence in the design of the Works. This insurance shall be for a limit of not less than Rs. 50 Lakh and shall be maintained in full force and effect from the Commencement Date of the Works until 03 years after the date of completion of the

Defect Notification period.

- ii. The Engineer will not issue any payment certificate until the Contractor has provided evidence of this insurance and its period of effectiveness.
- iii. 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.
- iv. The Contractor shall also obtain any additional insurance cover as per the requirements of the Contract or Law of the Country.
- v. 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.
- vi. 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.
- vii. 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 Contractor. 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.
- viii. Contractor shall engage at least one qualified civil graduate Engineer at each work site just after receipt of LOA(Not Beyond 15 Days) till physical completion of work or for the duration as instructed by DFC Engineer. Contractor should submit followings in support of Engagement/Deployment of site Engineer:-

(i). willingness of the site Engineer to work with contractor.

(ii). Appointment letter issued by the contractor in F/O site engineer proposed to engage.

(iii) Copies in support of academic & technical qualification of the site Engineer proposed for engagement duly signed by Contractor and site Engineer proposed for engagement.

Failing to comply the above instruction will liable for recovery @ Rs.50,000/- Per month or part thereof from the dues of contractor."

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's 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.50 lakh for any one accident without any limit on the number of accidents.
- (d) The contractor shall be responsible for all repairs and rectification of damages to completed works or works under execution due to 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 /DFCCIL premises, but shall then conform to the rules and regulations of the Railway /DFCCIL 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 /DFCCIL 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 DFCCIL 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 /DFCCIL, in such a way that they do not hinder Railway / DFCCIL train operation or affect the proper functioning of or damage any DFCCIL equipment, structure or rolling stock except as agreed to by the employer, provided that all damage and disfiguration caused by the contractor 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 /manpower 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 month 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 General Manager / 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

- (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 equipment's / 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 items provided in any case that the Contractor has complied fully with his obligations under clause 1.5.15 in respect of each item, 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 suo-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 /Chapter-V (GCC/SCC) and in accordance with accepted schedule of prices, read with relevant para of the other parts and Chapters of the Tender Document. 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:-**

Performance Guarantee and security deposit will be governed as per relevant clause of GCC-2022 with advance correction slip/amendments issued before the date of inviting of tender.

1.5.20 **Advances to Contractor: - Not Applicable in this Contract**

(a) Mobilization 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.

These Advances shall be payable against irrevocable guarantee (Bank Guarantee, FDRs) from a scheduled commercial bank of India of at least 110% of the value of the sanctioned advance amount (covering principal plus interest).

(b) Advance Against Machinery and Equipment:

This advance shall be limited to a maximum of 10% of the contract value against new Machinery & Equipment, involving substantial outlay, brought to site and essentially required for the work. This advance shall not exceed 75% of the purchase price of such Equipment and shall be payable when hypothecated to the DFCCIL by a suitable bond or alternatively covered by an irrevocable Bank Guarantee for full cost of the Plant & Equipment from a Nationalized Bank in India or the State Bank of India in a form acceptable to DFCCIL. The Plant & Equipment shall be insured for the full value and for the entire period, these are required for the work. This plant & Equipment shall not be removed from the site of work without prior written permission of the Engineer. No advance should be given against old Plant & Machinery.

(c) Advances for accelerating progress of the work during course of execution of Contract:

This advance is to be decided on the merits of each case and shall be restricted to a maximum of 5% of contract value. This is to be granted by the Managing Director on the recommendations of the Engineer in-charge, in consultation with the Associate Finance. While recommending this advance for sanction of Managing Director, the Engineer in-charge shall also confirm that progress of the contract work has been as per milestones/targets laid down and no extension to Date of completion of the contract has been given on contractor's account.

(d) Advances in Exceptional Cases:

Managing Director is further empowered to grant advances in exceptional cases upto a maximum of Rs. 20 lacs in respect of even contract of value less than Rs. 25 crore, if considered absolutely essential, depending on the merits of each case and circumstances in each situation, to be recommended by the Engineer in-charge and in consultation with the Associate Finance.

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

- (i) The advances shall carry an interest of **10% (Ten Percent)**.
- (ii) Advances except those against machinery and equipment shall be payable against irrevocable guarantee (Bank Guarantee, FDRs, KVPs/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 / Schedule

Commercial Bank in India in a form acceptable to the DFCCIL. Format for BG is similar to Tender Form-19 placed at Part-IV of Tender Document.

- (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 @ 15% of each gross bill amount.
- (iv) That the grant of advance is primarily in DFCCIL's own interest.
- (v) That a contractor does not receive advances for same work from different officers.
- (vi) That arrangements are 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/DFCCIL 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 effected) and adjusted fully against on-account bill along with 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).

1.5.21 Statement of Dispute: - Refer to clause 63 and 64 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. The details of Independent External monitor (IEM) shall be collected from the office of CGM/GM-Co-ord. DFCCIL whenever required.

1.5.23 Deleted.

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 or introduction of new taxes, duties, levies, cess etc. 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 Shramikkalyan 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/DFCCIL's 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) and 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 shramikkalyan 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 representative 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 Shramikkalyan portal at „www.shramikkalyan.indianrailways.gov.in“ till-----Month-----Year."

1.5.26 STATUTORY COMPLIANCES:

The Contractor shall;

(a) Accept full and exclusive liability for the personnel deployed and other obligations referred under the laws/rules/regulations now and thereafter imposed by the appropriate government/authorities.

(b) Keep DFCCIL indemnified against all losses, damages or liability arising out of or imposed in the course of employment of such persons or arising in accordance with any labour laws. DFCCIL will not have any liability whatsoever concerning the persons deployed by the Contractor for the purpose.

(c) If as a result of any claim arising out of any reasons stated in 2 (b) above or due to any negligence on part of the personnel deployed, if DFCCIL is made to pay any amount, then DFCCIL shall recover the same from the payment due to the Contractor or send a notice to the Contractor for refund of the same to the DFCCIL and the Contractor shall be liable to

reimburse the same within 7 working days of the receipt of such notice. The Bidder shall comply all statutory requirements including compliance of LAWS, Acts, Rules and Regulations.

1.5.27 Deleted.

1.5.28 Deleted.

TECHNICAL SPECIFICATIONS

PART - II

TECHNICAL SPECIFICATIONS

For technical specifications, refer relevant Indian Railways Unified Standard Specifications, as amended upto date, the specification for fabrication and erection of steel girder bridges and Locomotive Turn Table (Fabrication Specification), Serial No B1 - 2001 amended upto date other IRS/IRC/IS Codes and Specifications as applicable.

For Non-Schedule items, the specifications in Tender Document / Schedule shall be applicable.

In case of any conflict between Technical Specification, Additional Technical Specification mentioned in Part-II and Part-III of Tender Document, Codes / Specifications mentioned above or otherwise or regarding correct applicability of relevant specification, the decision of Engineer shall be final and binding.

PART - II

Chapter I

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

**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 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 specifications for cement are:

- (i) Ordinary Portland Cement conforming to IS: 269: 2015
- (ii) 43 Grade Ordinary Portland Cement conforming to IS: 8112 (1989)
- (iii) 53 Grade Ordinary Portland Cement conforming to IS: 12269 (1987)
- (iv) Rapid Hardening Ordinary Cement conforming to IS: 8041
- (v) Hydrophobic Portland cement conforming to IS: 8043

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: 12174:1987 or any other approved composite bags, bearing the following information in legible markings:

1. Manufacturer's name or Registered Trade Mark of manufacturer, if any.
2. Grade of cement
3. Type of cement
4. Weight of each bag in Kg.
5. Date of manufacture,

6. 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:

1. Compressive strength
2. Initial and final setting time
3. Consistency
4. Soundness.
5. 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 sitecleared 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 Indian Railways Unified Standard Specifications, 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 paymentfor 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.

PART - II
Chapter II

**GENERAL GUIDELINES REGARDING SPECIFICATIONS AND SPECIAL
CONDITIONS FOR
CONCRETE WORKS**

**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 Railways Unified Standard Specifications, 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 Indian Railways Unified Standard Specifications (Formation Works, Bridge Works and P. Way Works), Engineering Department - 2019
- (v) 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 500D/550D) shall be procured as per specification mentioned in IS: 1786:2008 with latest Amendments. 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. The environmental condition for this work is 'MODERATE'
- 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 relevant standard.

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 manufacturers 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.

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 substructure and 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.

Max size of Aggregate, Target Mean Strength			
Grade of Concrete	Max size of Aggregate (mm)	Characteristic Strength (fck) at 28 days (N/mm ²)	Target Mean Strength (fck) 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

- (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.
- (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

- 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

- 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/m³. 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 5⁰ 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 shows 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)	01 No.
2.	Transit Mixers (4 to 7 cum capacity)	3 Nos.
3.	Concrete Vibrators (2 HP capacity)	4 Nos.
4.	Vibrators of Needles (60mm & 40mm)	4 Nos.
5.	Screed vibrator	2 Nos.
6.	Form vibrator (500 watts capacity)	2 Nos.
7.	Generator (35 KV capacity)	1 No.
8.	Welding set (3 to 5 KV capacity)	2 No.
9.	Reinforcement Steel Cutting Machine	2 No.
10.	Reinforcement Steel Bending Machine	2 No.
11.	Concrete Pumps (10 to 20 HP capacity with 40m pipe length)	1 No.
12.	Hydra 12.0 T capacity crane	1 No.
13.	Concrete Funnel Bucket	1 No.
14.	Air compressor (100 to 150 cum capacity)	1 No.
15.	Concrete Dumpers	2 Nos.
16.	Any other including power lifts etc., as required to suit site	Adequate No.

2.2.20.2 All the machinery 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 tilted. 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

1. 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.
2. 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 coarse 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 & falsework shall conform to the specified quality consistent with the intended purpose and actual site condition as applicable. All shuttering, form work, falsework, 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.
- 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.

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	1) + 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

2.2.27 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
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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 ± 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 Indian Railways Unified Standard Specifications , 2010 / IRS Concrete Bridge Code/ Relevant IS Code. 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 At 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.

PART - II
Chapter III
GENERAL GUIDELINES REGARDING SPECIFICATIONS AND SPECIAL
CONDITIONS FOR BORED CAST-IN-SITU RCC PILE
FOUNDATIONS

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 data shall be provided by the DFCCIL 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 Indian Railways Unified Standard Specifications, 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 Indian Railways Unified Standard Specifications, 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.

- (i) The concrete should be coherent, rich in cement with high slump and restricted water cement ratio.
- (ii) 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.
- (iii) 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.
- (iv) 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.
- (v) 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.
- (vi) All tremie tubes should be scrupulously cleaned after use.
- (vii) 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.
- (viii) 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. Depth of piles is likely to vary as per design and load test. The payment will be done as per actual quantity executed by the contractor as under relevant items of Schedule. 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 equipment 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 founding level of pile as per approved drawing. 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 pullout 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/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 conform 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, chiseling 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

- 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 60 stoke. 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

(i) Contractor will ensure the layout of bridge and its component to the complete satisfaction of Engineer-In-charge before start of any work.

(ii) 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.

(iii) 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.

(iv) 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.

(v) 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 out flowing slurry is similar.

(vi) 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 to 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.

PART - II
Chapter IV
GENERAL GUIDLINES REGARDING SPECIFICATIONS AND SPECIAL
CONDITIONS FOR SUPPLY OF REINFORCEMENT AND STRUCTURAL STEEL

2.4 GENERAL GUIDLINES AND SPECIFICATIONS FOR SUPPLY OF REINFORCEMENT AND STRUCTURAL STEEL

2.4.1 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.

2.4.2 SPECIFICATIONS FOR STEEL:

2.4.2.1 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 500D/Fe550D conforming / satisfying to IS 1786:2008 (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)/or Grade E350(Fe490) as mentioned in the tender schedule and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans.

(iii) Relevant other IS and IRS Specifications with regard to properties, testing and use of the above steel items also shall govern.

2.4.2.2 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.

2.4.2.3 The Contractor shall arrange to carryout additional tests on physical properties of steel for every 50 metric tonne (MT) 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.

2.4.3 PROCUREMENT OF STEEL:

2.4.3.1 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.

2.4.3.2 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.

2.4.4 REINFORCEMENT AND STRUCTURAL STEEL:

2.4.4.1 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.

2.4.5 STAGE PAYMENTS FOR STRUCTURAL STEEL:

2.4.5.1 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.

2.4.5.2 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.

(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) If fabrication is done at the Contractor's workshop/factory premises, the stage payment as prescribed in tender schedule shall be released subject to submission of Indemnity Bond of equivalent amount.
- (ix) No Stage payment is permitted for steel required for temporary and enabling works.

2.4.5.3 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.

2.4.6 OTHERS:

- 2.4.6.1 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.
- 2.4.6.2 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.
- 2.4.6.3 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.
- 2.4.6.4 Contractor shall remove from site any steel materials rejected by the Engineer within reasonable time as specified by him.
- 2.4.6.5 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.

PART - II
Chapter V

**GENERAL GUIDELINES REGARDING SPECIFICATIONS AND SPECIAL
CONDITIONS FOR FABRICATION, ERECTION & LAUNCHING OF STEEL
PLATE GIRDER FOR ROB**

**2.5 GENERAL GUIDELINES AND SPECIFICATIONS FOR FABRICATION &
ERECTION OF PLATE GIRDER AND SPECIAL CONDITIONS**

2.5.1 GENERAL:

This chapter covers the supply of material, fabrication, assembly and erection of bow string steel girders 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 (Works and Materials), 2019 amended upto date, Issued under the authority of Chief Engineer, North Central 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.

Bow string steel girder is 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 ROBs. Hence, Carriage way width of this bridge is 7.50 m. The superstructure includes two RCC crash barriers in ROBs, steel railing in case of bow string girder. The wearing coat is made of plain concrete. The wearing coat is 65 mm thick in bow string steel girder. The cross drainage slope of 1: 40 is in the deck slab to drain the water. 50 mm dia GI pipe shall be used as drainage spouts.

The RCC deck slab has been designed with design Mix Concrete with grade of Concrete M40. The environmental exposure condition of this area where 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.

The bearings used in these girders are POT and POT cum PTFE (Poly Tetra Floro Ethylene).

Bow string girders 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 bow string girder by metallizing with sprayed aluminium as recommended in RDSO drawings.

For fabrication and welding of steel Girders, the Contractor shall submit QAP and WPSS for approval of inspecting agency nominated by DFCCIL. The fabrication and welding shall be done based on approved QAP and WPSS/WPQR.

The Contractor will be required to develop jigs & Masters for each components of bow string 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 S A W (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. The gas Shield to be used in the FCAW process may be CO₂, Argon or /CO₂- Argon mixture.

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 is optional and 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.

2.5.2 **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 equipment 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.

2.5.3 **Brief Design Data**

The composite steel girders has been designed as per relevant IRS / IRC / RDSO codes and specifications.

2.5.4 **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).

2.5.4.1 **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 date.
- (ii) IRS : Welded Bridge Code (1989)
- (iii) IRS : Steel Bridge Code (2003)
- (iv) IRS: M-28 Specifications for electrodes.
- (v) IRS: M-39 Specification for wire flux for SAW.

2.5.4.2 **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)

2.5.5 **Materials**

2.5.5.1 Steel (Plates and Rolled sections) should conform to IS: 2062-2011. 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. Steel of grade E350 has been used in bow string steel girder as cross beams of ISMB 600.

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 carryout 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.

2.5.5.2 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.

2.5.6 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.

2.5.7 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.

2.5.8 Stacking Materials:

- (a) 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.**
- (b) 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.**
- (c) 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.

- (d) 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.**
- (e) 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.**
- (f) The tenderer shall unload the material promptly on delivery; otherwise the tenderer shall be responsible for demurrage charges.**
- (g) On receipt of rolled steel at workshop or fabrication yard, they shall be carefully unloaded and stacked properly to avoid bending, twisting, corrosion etc.**

2.5.9 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 interchangeable 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.**

2.5.10 Interchange ability:

(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.

2.5.11 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.

2.5.12 If the tenderer propose 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.

2.5.13 HSFG bolts shall be provided as per approved drawing.

2.5.14 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.

2.5.15 All welding consumables (electrodes, wire, flux etc.) shall be procured only from the manufacturers approved by RDSO subject to final approval by Engineer.

2.5.16 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, stagings and refuse, or other materials produced by his operations and shall leave the site in a clean and tidy condition.**

2.5.17 Fabrication

2.5.17.1 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 GM/ROB or CPM/TDL, 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.

2.5.17.2 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 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.

2.5.17.3 Maintenance of records by Fabricators

The records of fabrication shall be maintained by the fabricator in the registers such as Jigs register, HSG 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.

2.5.17.4 Tolerance in Fabrication

Basically, Bow string Girder is open web girders. 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.

2.5.18 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.

2.5.19 Flattening and Straightening

2.5.19.1 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.

2.5.19.2 Flattening and straightening under hot condition shall not be carried out unless authorized and approved by the Engineer.

2.5.20 Planing and Shearing

2.5.20.1 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.

2.5.20.2 Should the inspection find it necessary, the cut edges shall be ground afterwards.

2.5.20.3 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.

2.5.20.4 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.

2.5.21 Flame Cutting

2.5.21.1 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.

2.5.21.2 All flame cut edges shall be ground to obtain reasonably clean square and true edges. Draglines produced by flame cut should be removed.

2.5.21.3 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.

2.5.21.4 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.

2.5.22 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 GM/ROB, /CPM, DFCCIL. Only approved and stamped jigs shall be used for fabrication.

2.5.22.1 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.

2.5.23 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.

2.5.24 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.

2.5.25 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.

2.5.26 Temporary Bolts, Nuts & Washers:

Refer Cl.28.1 to Cl.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 micron thick, as per IS: 4759.

2.5.27 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.

2.5.28 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.

2.5.29 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.

2.5.30 Sequence of welding and welding pass

For fabrication of welded Bow string girder, 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.

2.5.31 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.
- (IV) 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):

Signature of Tenderer (s) with Seal

- **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 welds 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), arc Length, arc voltage etc.

2.5.32 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.

2.5.33 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.

2.5.34 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'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 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.

2.5.35 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 to 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 ensure 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.**

2.5.36 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 transformers 3+**
- (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.

2.5.37 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.

2.5.38 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).

2.5.38.1 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.

2.5.38.2 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.

2.5.38.2.1 Purity of Aluminium

The chemical composition of aluminium to be sprayed shall be 99.5% aluminium conforming to IS: 2590.

2.5.38.2.2 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.

2.5.38.2.3 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).

2.5.38.3 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.

2.5.38.4 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

2.5.38.5 Method for the Determination of Local Thickness

2.5.38.5.1 Equipment

Any magnetic or electro-magnetic thickness meter that will measure local thickness of a known standard with an accuracy of ± 10 percent.

2.5.38.5.2 Calibration of Instrument

Calibrate and check the meter on one of the following standards (as appropriate):

(i) (Applicable to magnetic and electro-magnetic meters 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.

2.5.38.5.3 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 cm² area.

With meters having two such probes, each reading shall be the average of two determinations with the probes reversed position.

2.5.38.6 Method of Test for Adhesion

Using a straight edge and hardened steel scribe 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.

2.5.38.7 Inspection

2.5.38.7.1 Determination of Local Thickness

The minimum local thickness shall be determined by the method described above.

2.5.38.7.2 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.

2.5.39 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 / Barger 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. If the test results do not conform to relevant IS specifications fully, then the lot 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.

2.5.40 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.

2.5.41 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.

2.5.41.1 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.

2.5.42 ASSEMBLY & ERECTION

2.5.42.1 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 use 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.

2.5.42.2 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.

2.5.42.3 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.**

2.5.43 Care during Assembly at Workshop

2.5.43.1 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.

2.5.43.2 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.

2.5.43.3 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.

2.5.44 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.

2.5.45 Assembly at site

2.5.45.1 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.

2.5.45.2 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.

2.5.45.3 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.

2.5.45.3.1 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 Signature of Tenderer (s) with Seal

2.5.45.3.2 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.

2.5.45.3.3 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.

2.5.45.4 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.

2.5.46 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.

2.5.47 Field Bolts, Nuts and Service Accessories

2.5.47.1 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.

2.5.47.2 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.

2.5.47.3 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).

2.5.48 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.

2.5.49 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 or faults for which the contractor is liable under the contract, shall be made good by the contractor to Engineer's 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.

2.5.50 Erection & Equipment:

2.5.50.1 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.

2.5.50.2 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.

2.5.50.3 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.

2.5.50.4 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.

2.5.50.5 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.

2.5.50.6 When chains are used for lashing, care must be taken to protect the edges of members to avoid the marking and distortion otherwise caused.

2.5.50.7 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.

2.5.50.8 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.

2.5.50.9 Temporary bracing shall be provided to take care of stresses from erection equipment or other loads carried during erection.

2.5.51 ADDITIONAL SPECIAL CONDITIONS:

2.5.51.1 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.

2.5.52.2 Further Drawing and Instructions:

- (i) GM/ROB,/CPM, 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 GM/ROB,/CPM, 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.**

2.5.52.3 Commencement 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.

2.5.52.4 Contractor 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.

2.5.52.5 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.

2.5.52.6 Any Doubted Points to be referred to the 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 GM/ROB, /CPM, DFCCIL. Only such reply as the said GM/ROB, /CPM, DFCCIL may be in writing given shall be taken as the authoritative interpretation of the point in doubt or obscurity.

2.5.52.7 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.

2.5.52.8 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.

2.5.52.9 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.

2.5.52.10 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.

2.5.52.11 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 are 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.

2.5.53 METHOD OF MEASUREMENT FOR PAYMENT

2.5.53.1 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 fieldbolts, 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.

2.5.54 BEARING

POT and POT-PTFE bearings is applicable here as per approved drawings No RITES/RCED/ROB/SUPER-STRUCTURE/ BEARING LOAD /48M/1 and RITES/RCED/ROB/SUPER-STRUCTURE / BEARING LOAD /60M/1. 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.

Tender document no EDFC_CGM_TDL_ROB_5C

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.

The contractor shall also submit a Guarantee Bond for bearing on the format given in Form No. 23.

2.5.55 DEFLECTION TESTS:

The deflection test shall be carried out as per additional specifications. Load testing will be paid separately as per relevant item.

**ADDITIONAL
TECHNICAL SPECIFICATION**

PART - III
ADDITIONAL TECHNICAL SPECIFICATIONS
Chapter I
STUD SHEAR CONNECTOR

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 26mm (+0.5/-0mm). 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 **Measurements:** The work shall be enumerated. Its unit is "each".

3.1.5 **Rates:** -The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above. The rate for Stud Shear Connector is included in the respective item for girder fabrication, so no separate payment for this item will be made.

PART - III
Chapter II
LOAD TESTING OF BRIDGE

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

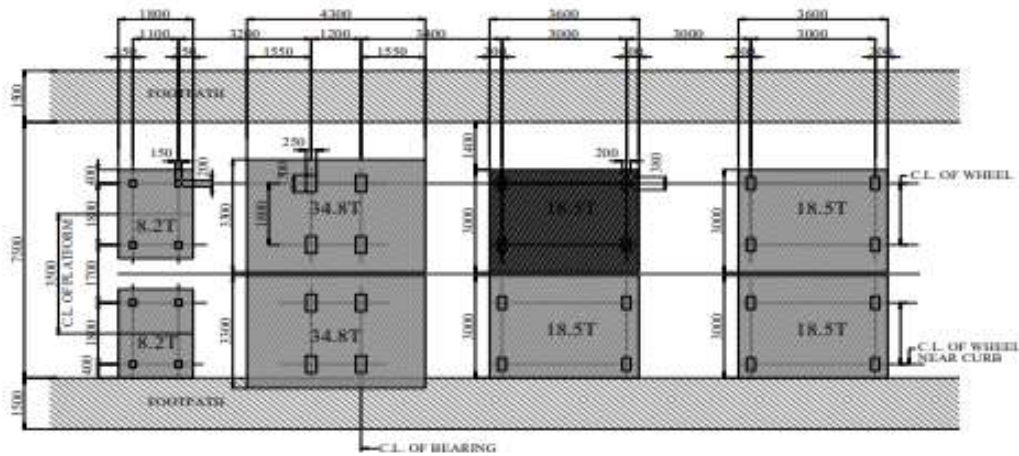
3.2.4 Simulation of the specific IRC vehicle

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.

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.



PLACEMENT OF 2-LANES OF IRC CLASS-A LOADING AND FOOT6PATH LOADING ON CARRIAGEWAY

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 behavior is reflected in the load v/s deflection data. If 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 observed, measured and recorded at regular intervals of one hour over a period of 24 hours:

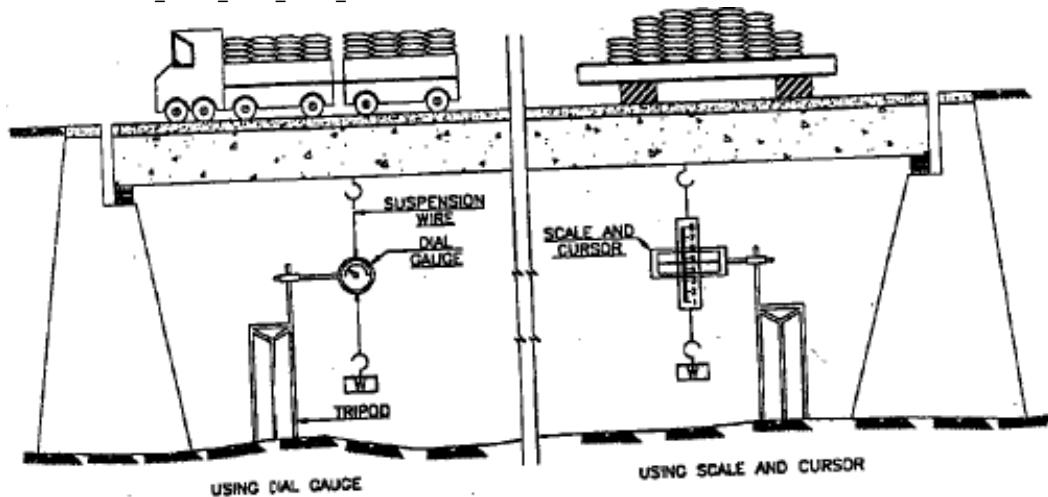
1. Deflections at critical sections (for instance for simply supported spans at mid-span and at quarter-span. In box girders, it will be useful to record deflections under each of the external ribs).
2. Appearance of cracks and their development, length, width, location, orientation correlated with load.
3. Deformation of bearings.
4. 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:

1. Dial gauges
2. Scale and cursor
3. Deflectometers
4. Precision level
5. 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.



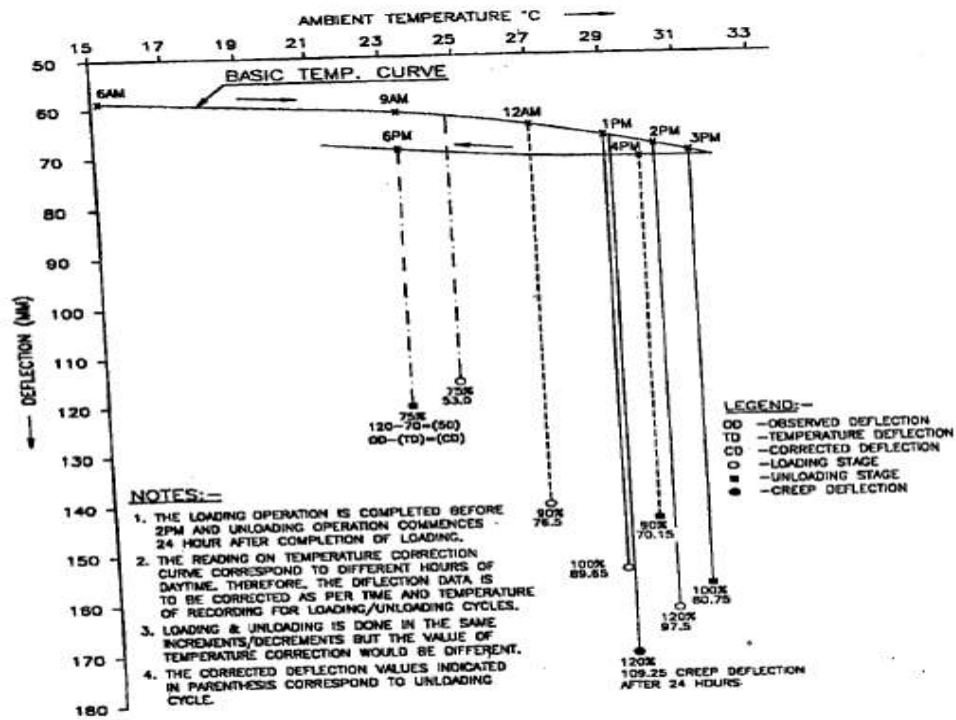
The deflection measurement can be done by suspension wire method at the required locations using dial gauges (Fig.). In this method trestles or posts 1.5m tall would be embedded in firm ground and dial gauges of least count 0.01 mm are clamped to them. The spindles of the dial gauges are connected by 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 deflections.

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

Signature of Tenderer (s) with Seal

Total recovery 24 hrs after removal of test load R3-R5

Percentage of recovery of deflection ... $\frac{(R3-R5)}{R3-R1} \times 100$

24 hrs after removal of test load (R3-R1)

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

S. No.	Type of Bridges	Live Load Intensity for Testing	Duration of Retention of TestLoad (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.

PART - III**Chapter III****SPECIFICATION FOR ROADS & REINFORCED EARTH CONSTRUCTION****3.3 SPECIFICATION FOR ROADS & REINFORCED EARTH CONSTRUCTION****3.3.1 EXTRACT FROM THE SECTION 400 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)****3.3.1.1 Construction of 200 mm thick compacted coarse granular subbase (Grade-I crushed B.T materials of 53 mm to 26.5 mm @ 35 %, 26.5 mm to 4.75 mm @ 45% , Below 2.36 mm @ 20 %) by providing close graded material , mixing in a mechanical mix plant at OMC, carriage of a mix material to work site, spreading uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve desire density, complete clause as per 401.**

This work shall consist of laying and compacting well graded material on prepared sub grade in accordance with the requirements of these specifications. The material shall be laid in one or more layers sub base and upper sub base (termed as sub base herein after) as necessary according to lines, grades and cross sections shown on the drawings or as directed by the Engineer.

MORTH 401.2 Materials:

MORTH 401.2.1 The materials to be used for the work shall be crushed stone of required grading. The material shall be free from organic or other deleterious constituents and confirm to the coarse graded granular sub base grading II as mentioned below.

MORTH TABLE 400-2.**GRADING FOR COARSE GRADED GRANULAR SUB-BASE MATERIALS.**

IS sieve Designation	Percent by weight passing the IS sieve. Grading I
75.0 mm	100
53.0 mm	–
26.5 mm	55 – 75
9.5 mm	–
4.75 mm	10 – 30
2.365 mm	
0.425 mm	
0.075 mm	< 10
CBR Value (Minimum)	30

Material passing 425 micron (0.425 mm) sieve for all the three grading when tested according to IS : 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively.

MORTH 401.2.2 Physical requirements:

The materials shall have a 10 percent fines value of 50 KN or more (for sample in soaked condition) when tested in compliance with B.S.: 812 (Part 111). The water absorption value of the coarse aggregate shall be determined as per IS : 2386 (Part 3) : if this value is greater than 2

percent, the soundness test shall be carried out on the material delivered to site as per IS : 383. For grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 percent.

MORTH 401.3 Strength of sub-base.

It shall be ensured prior to actual execution that the material to be used in the sub base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the "Quality" of materials, as may be necessary.

MORTH 401.4 Construction Operations:

MORTH 401.4.1 Preparation of Sub grade:

Immediately prior to the laying of sub-base, the sub grade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 KN smooth wheeled roller.

MORTH 401.4.2 Spreading and compacting:

The sub-base material of grading specified in the Contract shall be spread on the prepared sub grade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.

When the sub-base material consists of combination of materials mentioned in MORTH Clause 401.2.1, of this item mixing shall be done mechanically by the mix in place method.

Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small-sized jobs. The equipment used for mix-in-place construction shall be a rotator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface of other means approved by the Engineer so that, at the time of compaction, it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS:2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc barrows, rotators until the layer is uniformly wet.

Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 KN weight may be used. For a compacted single layer up to 225 mm the compaction shall be done with help of a vibratory roller of minimum 80 to 100 KN static weight with plain drum or pad foot drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight having a minimum tyre pressure of 0.7 MN/ M2 or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall and super elevation and shall commence at the edges and progress towards the centre for portions having cross fall on both sides each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high sports or depressions, which

become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 Km per hour. Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS: 2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

MORTH 401.5 Surface Finish and Quality Control of work:

The surface finish of construction shall conform to the requirements of Clause 902 of MORT & H specifications. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MORT & H specifications.

MORTH 401.6 Arrangements for Traffic:

During the period of construction, arrangement of traffic shall be maintained in accordance with Clause 112 of MORT & H specifications.

MORTH 401.7 Measurements for Payment: Granular sub base shall be paid as finished work in position on cross sectional measurements and computing the volume of GSB work in cubic meters by average area method.

The protection of edges of granular sub base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

MORTH 401.8 Rate:

The Contract unit rate for granular sub base shall be payment in full for carrying out the required operations including full compensation for:

- [i] Making arrangements for traffic to Clause 112 as above except for initial treatment to verges, shoulders and construction of diversions.
- [ii] Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lift.
- [iii] All labour, tools, equipment and incidentals to complete the work to the specifications.
- [iv] Carrying out the work in part widths of road where directed, and
- [v] Carrying out the required tests for quality control.

3.3.1.2 Providing and laying wet mix macadam base course 250 mm thick in two layers using machine crushed B.T. chips as per required gradation mixing with required optimum quantity of water, conveying the mix to site and spreading to grade and camber with mechanical paver and consolidation by vibratory roller including material, labour, plant and machinery and equipment etc. complete.

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared sub grade sub base/ base or existing pavement as the case may be in accordance with the requirements of these specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 20cm upon approval of the Engineer.

MORTH 406.2 MATERIALS

MORTH 406.2.1 AGGREGATES**MORTH 406.2.1.1 PHYSICAL REQUIREMENTS:**

Course aggregates shall be crushed stone. If crushed gravel / shingle is used, not less than 90 percent by weight of the gravel / shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-12 below.

MORTH TABLE 400-12 PHYSICAL REQUIREMENT OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE / BASE COURSES

Test	Test Method	Requirements
1.*Los Angeles Abrasion value	IS : 2386 (Part-4)	40 percent (Max)
Aggregate impact value	IS : 2386 (Part-4) or IS : 5640	30 percent (Max)
2. Combined Flakiness and Elongation indices (Total)**	IS : 2386(PART-1)	30 percent (Max)

* Aggregates may satisfy requirements of either of the two tests.

** To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample only the elongated particles be separated out from the remaining (non flaky stone metal). Elongation index is weight of elongated particles divided by total non flaky particles. The value of flakiness index and elongation index so found are added up.

If the water absorption value of the coarse aggregate greater than 2 percent, the soundness test shall carried out on the material delivered to site as per 2386 (Part – 5).

MORTH 406.2.1.2 Grading requirements:

The aggregates shall conform to the grading given in Table 400-13

MORTH TABLE 400-13. GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADAM.

<i>Is Sieve Designation</i>	Percent by weight Passing the IS sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 micron	8-22
75.00 micron	0-5

Materials finer than 425 micron shall have plasticity index (P.1) not exceeding 6.

The final gradation approved within these limits shall be well graded from course to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice- versa.

MORTH 406.3 Construction Operation:

MORTH 406.3.1 Preparation of base: Clause 404.3.1 as below shall apply.

MORTH 404.3.1 Preparation of base: The surface of the sub grade/sub-base/base to receive the water bound macadam course shall be prepared to the specification lines and cross fall (camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled unit firm surface is obtained if necessary by sprinkling water. Any sub-base/base/surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (levelling course) to clause 501 of these specification.

As far as possible, laying water bound macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it. However, where the intensity of rain is low and the interface drainage facility is efficient, water bound macadam can be laid over the existing thin bituminous surface by cutting 50 mm x 50 mm furrows at an angle of 45 degrees to the centre line of the pavement at one metre intervals in the existing road. The directions and depth of furrows shall be such that they provide adequate bondage and also serve to drain water to the existing granular base course beneath the existing thin bituminous surface.

MORTH 406.3.2 Provision of lateral confinement of aggregates:

While constructing wet mix macadam arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 407.4.1 as below.

MORTH 407.4 Construction Operations:

MORTH 407.4.1 Shoulder:

The sequence of operations shall be such that the construction of paved shoulder is done in layers each matching the thickness of adjoining pavement layer. Only after a layer of pavement and corresponding layers in paved and earth shoulder portion have been laid and compacted, the construction of next layer of pavement and shoulder shall be taken up.

Where the materials in adjacent layers are different, these shall be laid together and the pavement layer shall be compacted first. The corresponding layer in paved shoulder portion shall be compacted thereafter, which shall be followed by compaction of earth shoulder layer. The adjacent layers having same material shall be laid and compacted together.

In all cases where paved shoulders have to be provided along side of existing carriageway, the existing shoulders shall be excavated in full width and to the required depth as per clause 301.3.7 under no circumstances; box cutting shall be done for construction of shoulders.

Compaction requirement of earthen shoulder shall be as per table 300-2 in the case of bituminous courses, work on shoulder (earthen/hard/paved), shall start only after the pavement course has been laid and compacted.

During all stages of shoulder (earth/hard/paved) construction, the required cross fall shall be maintained to drain off surface water

Regardless of the method of laying, all shoulder construction material shall be placed directly on the shoulder. Any spilled material dragged on to the pavement surface shall be immediately removed, without damage to the pavement, and the area so affected thoroughly cleaned.

MORTH 406.3.4 Preparation of mix:

Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having

provision for controlled addition of water and forced / positive mixing arrangement like pug-mil or pan type mixer of concrete batching plant.

Optimum moisture for mixing shall be determined in accordance with IS : 2720 (Part – 8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 micron to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and so segregation should be permitted.

MORTH 406.3.4 Spreading of mix:

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade / sub-base / base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The paver finisher shall be self – propelled, having the following features:

- (i) Loading hoppers and suitable distribution mechanism
- (ii) The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
- (iii) The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be tested by depth blocks during construction.

No segregation of larger and fine particles should be allowed. The aggregates as spread should be allowed. The aggregates as spread should be of uniform gradation with pockets of fine materials.

MORTH 406.3.5 Compaction:-

After the mix has been laid to the required thickness, grade and camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100mm, a smooth wheel roller of 80 to 100 KN weight may be used. For a compacted single layer up to 200mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall / super elevation rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road. Uniformly over-lapping each preceding track by at least one fourth width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should be at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding tracks by at least one – Fourth width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and / or removed and made good.

Along forms, Kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub grade is soft or yielding or when it caused a wave-like motion in the sub – base/ base course or sub grade. If irregularities develop during rolling which exceed 12mm when tested with a 3 meter straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry the material as determined by the method outlined in IS: 2720 (Part-8)

After completion, the surface of any finished layer shall be well-close, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

MORTH 406.3.6 Setting and drying:

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

MORTH 406.4 Opening to Traffic:

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course laid.

MORTH 406.5 Surface Finish and Quality control of work

MORTH 406.5.1 Surface evenness:

The surface finish of construction shall conform to the requirements of Clause 902 of MORT & H specifications.

406.5.2 Quality Control:

Control on the quality of materials and works shall be exercised by the Engineer in accordance with section 901 of MORT & H specifications

MORTH 406.6 Rectification of Surface Irregularity:

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub grade soil getting mixed with the aggregates, the full thickness of the layer shall scarified over the affected area. Reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3 of this item. The area treated in the aforesaid manner shall not be less than 5m long and 2m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

MORTH 406.6.7 Arrangement for Traffic:

During the period of construction, arrangement of traffic shall be done as per Claus 112 of MORT & H specifications

MORTH 406.8 Measurements for Payment:

Wet mix macadam shall be paid as finished work in position on cross sectional measurements and computing the volume of WMM work in cubic meters by average area method.

MORTH 406.9 Rate: The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed below.

- i) Making arrangement for traffic to Clause 112 as above Except for initial treatment to verges, shoulders and Construction of diversions:
- ii) Furnishing wet materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
- iii) All labour, tools, equipment and incidentals to complete the work to the specifications;
- iv) Carrying out the work in part widths of road where directed; and
- v) Carrying out the required tests for quality control.

3.3.1.3 Providing and laying wet mix base course macadam 150 mm in Two layer using machine crushed chips as per required gradation mixing with required optimum quantity of water conveying the mix to site and spreading to grade and camber with mechanical paver consolidation by vibratory roller including material, labour, plant and machinery and equipment etc. complete.

This work shall consist of Providing and laying wet mix macadam base course 150 mm thick in two layers coat as per **Item No.17** of this contract but excluding the cost of prime coat.

MORTH 406.8 Measurements for Payment:

Wet mix macadam shall be paid as finished work in position on cross sectional measurements and computing the volume of WMM work in cubic meters by average area method.

MORTH 406.9 Rate: The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed below:

- i) Making arrangement for traffic to Clause 112 as above Except for initial treatment to verges, shoulders and Construction of diversions:
- ii) Furnishing wet materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
- iii) All labour, tools, equipment and incidentals to complete the work to the specifications;
- iv) Carrying out the work in part widths of road where directed; and
- v) Carrying out the required tests for quality control.

3.3.2 EXTRACT FROM THE SECTION 500 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)

3.3.2.1 Providing and laying 90 mm DBM in single layer using crushed stone aggregate BT chips as per required gradation and using emulsion asphalt as a tack coat @ 2.5 kg / 10 sqmt and the VG-30 grade asphalt at 40 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by hot mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete

MORTH 505 DENSE BITUMINOUS MACADAM

MORTH 505.1 Scope

The specification describes the design and construction procedure for Dense Bituminous Macadam, (DBM), for use mainly, but not exclusively, in base/binder and profile corrective courses. The work shall consist of construction in a multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be 50 mm to 100 mm.

MORTH 505.2 Materials

MORTH 505.2.1 Bitumen

The bitumen shall be viscosity grade paving bitumen complying with the Indian Standard Specification IS:73, modified bitumen complying with Clause 501.2.1 or as otherwise specified in the Contract.

The type and grade of bitumen to be used shall be specified in the Contract.

MORTH 505.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the Contractor shall produce test results that with the use of anti-stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and as a condition for the approval of that source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacturer's recommendations, at the cost of the Contractor. The aggregates shall satisfy the requirements specified in Table 500-8.

Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

MORTH 505.2.3 Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two, passing the 2.36 mm sieve and retained on the 75 micron sieve. These shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. Natural sand shall not be allowed in binder courses. However, natural sand upto 50 percent of the fine aggregate may be allowed in base courses. The fine aggregate shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37). The plasticity index of the fraction passing the 0.425 mm sieve shall not exceed 4, when tested in accordance with IS:2720 (Part 5).

MORTH 505.2.4 Filler

Filter shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer. The filler shall be graded within the limits indicated in Table 500-9.

The filler shall be free from organic impurities and have a plasticity Index not greater than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8, then 2 percent by total weight of aggregate, of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

MORTH 505.2.5 Aggregate Grading and Binder Content

505.2.5.1 When tested in accordance with IS:2386 Part 1 (wet sieving method), the combined grading of the coarse and fine aggregates and filler for the particular mixture shall fall within the limits given in Table 500-10 for grading 1 or 2 as specified in the Contract. To avoid gap grading, the combined aggregate gradation shall not vary from the lower limit on one sieve to higher limit on the adjacent sieve.

Table 500-8 : Physical Requirements for Coarse Aggregate for Dense Bituminous

Macadam

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices*	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35% Max 27%	IS:2386 Part IV
Durability	Soundness either :Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Water Absorption	Water Absorption	Max 2%	IS:2386 Part 111
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength**	Min. 80%	AASHTO 283

* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

** If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

Table 500-9 : Grading Requirements for Mineral Filler

IS sieve (mm)	Cumulative Percent Passing by Weight of Total Aggregate	
0.6	100	
0.3	95	— 100
0.075	85	— 100

Table 500-10: Composition of Dense Graded Bituminous Macadam

Grading	1	2
Nominal aggregate size*	37.5 mm	26.5 mm
Layer thickness	75 — 100 mm	50 — 75 mm
IS Sieve ¹ (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	95—100	100
26.5	63—93	90—100
19	—	71—95

13.2	55—75	56—80
9.5	—	—
4.75	38—54	38—54
2.36	28—42	28—42
1.18	—	—
0.6	—	—
0.3	7—21	7—21
0.15	—	—
0.075	2—8	2—8
Bitumen content % by mass of total mix	Min 4.0**	Min 4.5**

* The nominal maximum particle size is the largest specified sieve size upon which any of the aggregate is retained.

** Corresponds to specific gravity of aggregates being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is — 10°C or lower, the bitumen content may be increased by 0.5 percent.

MORTH 505.2.5.2 Bitumen content indicated in Table 500-10 is the minimum quantity. The quantity shall be determined in accordance with Clause 505.3.

MORTH 505.3 Mix Design

The bitumen content required shall be determined following the Marshall mix design procedure contained in Asphalt Institute Manual MS-2.

The Fines to Bitumen (F/B) ratio by weight of total mix shall range from 0.6 to 1.2.

MORTH 505.3.1 Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11.

Table 500-11 : Requirements for Dense Graded Bituminous Macadam

Properties	Viscosity Grade Paving Bitumen	Modified bitumen		Test Method
		Hot climate	Cold climate	
Compaction level	75 blows on each face of the specimen			
Minimum stability (KN at 600C)	9.0	12.0	10.0	AASHTO T245
Marshall flow (mm)	2—4	2.5—4	3.5—5	AASHTO T245

Marshall Quotient Stability	2 — 5	2.5 — 5	MS-2 and ASTM D2041
Flow			
% air voids	3 — 5		
% Voids Filled with Bitumen (VFB)	65 — 75		
Coating of aggregate particle	95% minimum		IS:6241
Tensile Strength ratio	80% Minimum		AASHTO T 283
% Voids in Mineral Aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13		

MORTH 505.3.2 Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-11. The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Where maximum size of the aggregate is more than 26.5 mm, the modified Marshall method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in Table 500-12 shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

Table 500-12 : Minimum Percent Voids In Mineral Aggregate (VMA)

Nominal Maximum Particle Size' (mm)	Minimum VMA Percent Related to Design Percentage Air voids		
	3.0	4.0	5.0
26.5	11.0	12.0	13.0
37.5	10.0	11.0	12.0

Note : Interpolate minimum voids in the mineral aggregate (VMA) for designed percentage air voids values between those listed.

MORTH 505.3.3 Job Mix Formula

The Contractor shall submit to the Engineer for approval at least 21 days before the start the work, the job mix formula proposed for use in the works, together with the following details:

- i) Source and location of all materials;
- ii) Proportions of all materials expressed as follows:
 - a) Binder type, and percentage by weight of total mix;
 - b) Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;

- iii) A single definite percentage passing each sieve for the mixed aggregate;
- iv) The individual gradings of the individual aggregate fraction, and the proportion of each in the combined grading;
- v) The results of mix design such as maximum specific gravity of loose mix (Gmm), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test;
- vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch;
- vii) Test results of physical characteristics of aggregates to be used;
- viii) Mixing temperature and compacting temperature.

While establishing the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of these Specifications.

The mix job formula shall be based on the mix design prepared by GERI or Govt. Approved laboratory & same shall be got approved from Executive Engineer.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer.

The approved job mix formula shall remain effective unless and until a revised Job Mix Formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the Contractor to the Engineer for approval before the placing of the material.

MORTH 505.3.4 Plant Trials — Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-13 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

Table 500-13 : Permissible Variations in the Actual Mix from the Job Mix Formula

Description	Base/binder Course
Aggregate passing 19 mm sieve or larger	± 8%
Aggregate passing 13.2 mm, 9.5 mm	± 7%
Aggregate passing 4.75 mm	± 6%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	± 5%
Aggregate passing 0.3 mm, 0.15 mm	± 4%
Aggregate passing 0.075 mm	± 2%
Binder content	± 0.3%
Mixing temperature	± 10°C

MORTH 505.3.5 Laying Trials

Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid and compacted all in accordance with Clause 501. The laying trial shall be carried out on a suitable area which is not to form part of the works. The area of the laying trials shall be a minimum of 100 sq.m of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid.

The Contractor shall previously inform the Engineer of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. The compacted layers of Dense Graded Bituminous Macadam (DBM) shall have a minimum field density equal to or more than 92% of the density based on theoretical maximum specific gravity (0mm) obtained on the day of compaction in accordance with ASTM D 2041.

Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer, who may at his discretion require further laying trials.

MORTH 505.4 Construction Operations

MORTH 505.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply.

MORTH 505.4.2 Preparation of Base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer.

MORTH 505.4.5 Prime Coat

Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502, or as directed by the Engineer.

MORTH 505.4.6 Tack Coat

Where the material on which the dense bituminous macadam is to be laid is either bitumen bound layer or primed granular layer, tack coat shall be applied, as specified, in accordance with the provisions of Clause 503, or as directed by the Engineer.

MORTH 505.4.7 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3 and 501.4 shall apply. Table 500-2 gives the mixing, laying and rolling temperature for dense mixes using viscosity grade bitumen. In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with viscosity grade bitumen. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendations of the manufacturer. In order to have uniform quality, the plant shall be calibrated from time to time.

MORTH 505.4.8 Spreading

The provisions of Clauses 501.5.3 and 501.5.4 shall apply.

MORTH 505.4.9 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

MORTH 505.5 Opening to Traffic

It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

MORTH 505.6 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these Specifications.

MORTH 505.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

MORTH 505.8 Measurement for Payment

Dense Graded Bituminous Materials shall be measured as finished work in Tonnes of specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

MORTH 505.9 Rate

The contract unit rate for Dense Graded Bituminous Macadam shall be payment in full for carrying out all the required operations as specified and shall include, to all components listed in Clause 501.8.8.2. The rate shall include the provision of bitumen, at 4 percent and 4.5 percent by weight of the total mixture for grading 1 and grading 2 respectively.

No Extra payment shall be made for extra consumption of bitumen which is due to variation in proportion of bitumen in mix design & specified in the description of item above.

- 3.3.2.2 Providing and laying 30 mm Bitumen concrete using crushed stone aggregate BT chips as per required gradation and the VG-30 grade asphalt at 54 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by hot mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete.**

MORTH 507 BITUMINOUS CONCRETE

MORTH 507.1 Scope

This work shall consist of construction of Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single layer of bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be 30 mm/40 mm/50 mm thick.

MORTH 507.2 Materials**MORTH 507.2.1 Bitumen**

The bitumen shall conform to Clause 504.2.1.

MORTH 507.2.2 Coarse Aggregates

The coarse aggregates shall be generally as specified in Clause 504.2.2, except that the aggregates shall satisfy the physical requirements of Table 500-16 and where crushed gravel is proposed for use as aggregate, not less than 95 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

Table 500-16 : Physical Requirements for Coarse Aggregate for Bituminous Concrete

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 30% Max 24%	IS:2386 Part IV
Durability	Soundness either: Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Polishing	Polished Stone Value	Min 55	BS:812-114
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength*	Min 80%	AASHTO 283

* If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

MORTH 507.2.3 Fine Aggregates

The fine aggregates shall be all as specified in Clause 505.2.3.

MORTH 507.2.4 Filler

Filler shall be as specified in Clause 505.2.4.

MORTH 507.2.5 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and filler shall fall within the limits shown in Table 500-17. The grading shall be as specified in the Contract.

Table 500-17 : Composition of Bituminous Concrete Pavement Layers

Grading	1	2
Nominal aggregate size*	19 mm	13.2 mm

Layer thickness	50 mm	30-40 mm
IS Sieve' (mm)	Cumulative % by weight of total aggregate passing	
45		
37.5		
26.5	100	
19	90-100	100
13.2	59-79	90-100
9.5	52-72	70-88
4.75	35-55	53-71
2.36	28-44	42-58
1.18	20-34	34-48
0.6	15-27	26-38
0.3	10-20	18-28
0.15	5-13	12-20
0.075	2-8	4-10
Bitumen content % by mass of total mix	Min 5.2*	Min 5.4**

Note:

The nominal maximum particle size is the largest specified sieve size up on which any of the aggregate is retained.

Corresponds to specific gravity of aggregate being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is — 10°C or lower, the bitumen content may be increased by 0.5 percent.

MORTH 507.3 Mix Design**MORTH 507.3.1 Requirements for the Mix**

Clause 505.3.1 shall apply.

MORTH 507.3.2 Binder Content

Clause 505.3.2 shall apply.

MORTH 507.3.3 Job Mix Formula

Clause 505.3.3 shall apply.

MORTH 507.3.4 Plant Trials — Permissible Variation in Job Mix Formula

The requirements for plant trials shall be as specified in Clause 505.3.4, and permissible limits for variation as given in Table 500-18.

Table 500-18 : Permissible Variations in Plant Mix from the Job Mix Formula

Description	Permissible Variation
Aggregate passing 19 mm sieve or larger	± 7%
Aggregate passing 13.2 mm, 9.5 mm	± 6%

Aggregate passing 4.75 mm	± 5%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	± 4%
Aggregate passing 0.3 mm, 0.15 mm	± 3%
Aggregate passing 0.075 mm	± 1.5%
Binder content	± 0.3%
Mixing temperature	± 10°C

MORTH 507.3.5 Laying Trials

The requirements for laying trials shall be as specified in Clause 505.3.5. The compacted layers of bituminous concrete (BC) shall have a minimum field density equal to or more than 92 percent of the average theoretical maximum specific gravity (G_{mm}) obtained on the day of compaction in accordance with ASTM 02041.

MORTH 507.4 Construction Operations

MORTH 507.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply.

MORTH 507.4.2 Preparation of Base

The surface on which the bituminous concrete is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In locations where a mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer.

MORTH 507.4.5 Tack Coat

The provisions as specified in Clause 504.4.6 shall apply.

MORTH 507.4.6 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3, 501.4 and 504.4.7 shall apply.

MORTH 507.4.7 Spreading

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

MORTH 507.4.8 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

MORTH 507.5 Opening to Traffic

Provisions in Clause 504.5 shall apply.

MORTH 507.6 Surface Finish and Quality Control

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these

MORTH 507.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

MORTH 507.8 Measurement for Payment

Bituminous Concrete shall be measured as finished work in Tonnes of specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

MORTH 507.9 Rate

The contract unit rate shall be all as specified in Clause 504.9, except that the rate shall include the provision of bitumen at 5.2 percent & 5.4 percent for grading 1 and grading 2 by weight of total mix respectively. The variation in actual percentage of bitumen used will be assessed and the payment adjusted plus and minus accordingly.

3.3.2.3 Providing and applying priming coat with emulsion SS1 grade at the rate of 7.50 kg/ 10 Sq.mt. including cost of asphalt and preparing the surface heating, and applying etc. complete.

MORTH 502.1 Scope

This work shall consist of the application of a single coat of low viscosity liquid bituminous material to a porous granular surface preparatory to the superimposition of bituminous treatment or mix.

MORTH 502.2 Materials

MORTH 502.2.1 Primer : The choice of a emulsion bituminous primer shall depend upon the porosity characteristics of the surface to be primed as classified in IRC : 16 These are :

- (i) Surface of low porosity: such as wet mix macadam and water bound macadam.
- (ii) Surfaces of medium porosity; such as cement stabilized soil base,
- (iii) Surfaces of high porosity; such as a gravel base.

MORTH 502.2.2 Primer viscosity :

The type and viscosity of the primer shall comply with the requirements of IS 8887, as sampled and tested for bituminous primer in accordance with the standards. Guidance on viscosity and rate of spray is given in MORTH Table 500-1.

MORTH TABLE 500-1. VISCOSITY REQUIREMENT AND QUANTITY OF LIQUID BITUMINOUS PRIMER

Type of Surface	Kinematic Viscosity of Primer at 60° C (Centistokes)	Quantity of Liquid Bituminous Material per 10 Sq.M. (kg)
Low porosity	30 – 60	6 to 9
Medium porosity	70 – 140	9 to 12
High porosity	250 – 500	12 to 15

MORTH 502.2.3 Choice of primer : The primer shall be emulsion bitumen complying with IS 8887 of a type and grade as specified in the Contract or as directed by the Engineer. The use of medium curing cutback as per IS 217 shall be restricted only for sites at sub-zero temperatures or for emergency applications as directed by the Engineer.

MORTH 502.3 Weather and Seasonal Limitations

Bituminous primer shall not be applied to a wet surface (see 502.4.2) or during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10° C. Surfaces which are to receive emulsion primer should be damp. But no free or standing water shall be present.

Construction:

MORTH 502.4.1.1 Equipment :

The Primer distributor shall be a self-propelled or towed bitumen pressure sprayer equipped for spraying the material uniformly at specified rates and temperatures. Hand spraying of small areas. Inaccessible to the distributor, or as directed by the Engineer.

MORTH 502.4.2 Preparation of road surface : The surface to be primed shall be prepared in accordance with Clauses **501.8** .

MORTH 501.8 This work shall consist of preparing an existing granular surface and shall be performed on such widths and lengths as shown on the drawing or as directed by the Engineer.

Immediately prior to applying the primer the surface shall be carefully swept clean of dust and loose particles, care being taken not to disturb the inter locked aggregate. This is best achieved when the surface layer is slightly moist (lightly sprayed with water and the surface allowed to dry) and the surface should be kept moist until the primer is applied.

MORTH 502.4.3 Application of emulsion bituminous primer : The viscosity and rate of application of the primer shall be at rate of 7.5 Kg / 10 Sq.m. as directed. The bituminous primer shall be sprayed uniformly in accordance with Clause 501. The method for application of the primer will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

MORTH 502.4.4 Curing of primer and opening to traffic : A primed surface shall be allowed to cure for at least 24 hours or such other period as is found to be necessary to allow all the volatiles to evaporate before any subsequent surface treatment or mix is laid. Any unabsorbed primer shall first be blotted with an application of sand, using the minimum quantity possible. A primed surface shall not be opened to traffic other than that necessary to lay the next course. A very thin layer of clean sand may be applied to the surface of the primer, to prevent the primer picking up under the wheels of the paver and the trucks delivering bituminous material to the paver.

MORTH 502.5 Quality Control of Work :

For control of the quality of materials supplied and the works carried out, the relevant provisions of Section 901 of MORTH & H specifications shall apply.

MORTH 502.6 Arrangements for Traffic

During construction operations, arrangements for traffic shall be made in accordance with the provisions of Clause 112 of MORTH & H specifications.

MORTH 502.7 Measurement for Payment

Prime coat shall be measured in terms of surface area of application in square meters.

MORTH 502.8 Rate :-

The contract unit rate for prime coat with adjustments as described in Clause 502.7 of MORTH&H specification shall be payment in full for carrying out the required operations including full

compensation for all components listed below:

- [i] Making arrangements for traffic to Clause 112 as above except for initial treatment to verges, shoulders and construction of diversions.
- [ii] Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lift.
- [iii] All labour, tools, equipment and incidentals to complete the work to the specifications.
- [iv] Carrying out the work in part widths of road where directed, and
- [v] Carrying out the required tests for quality control.

Payment shall be made on the basis of the provision of prime coat at an application rate of 7.5 kg per 10 square meter, with adjustment, plus or minus, for the variation between this amount and the actual amount approved by the Engineer after the preliminary trials referred to in Clause 502.4.3. of MORT&H specification stated above.

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 fascia 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 steeper than 70° are categorized as reinforced soil walls and those with slope face angle less than 70° 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/sq.m.

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/sq.m.

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 Geosynthetics.

3103.7.2 Geogrids

The manufacturer of geogrids, geotextiles, geostrips, polymeric strips or straps, polymeric ties or any other geosynthetics material, including any proprietary geosynthetics 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 test 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

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 geosynthetics 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 geosynthetics 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 30° , 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 micron	0-60%
75 micron	less than 15
$PI \leq 6$	

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° .

Fly ash may be used as fill material in reinforced soil walls provided its angle of internal friction is not less than 30° .

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

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 conform to the requirements of Section 1700 of these 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 selvedged 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, fibre 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 geosynthetics
- b) Gabion facing
- c) Metallic facing, prefabricated in different shapes including welded wire gird andwoven 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 BOND

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 25 years. The Performance Guarantee Bond shall be submitted by the Contractor in the format provided in Form No. 23 duly signed by RE wall designer, specialized subcontractor and contractor.

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.

Stage payment for different activities shall be as mentioned in the relevant schedule of payments.

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, fascia 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

$$T_{al} = \frac{T_{ult}}{RF_{CR} \times RF_{ID} \times RF_{W} \times RF_{CH} \times f_s}$$

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 $RF_{CR} \times RF_{CH}$ 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	<i>RF_{CR}</i>	<i>RF_{ID}</i>	<i>RF_{CH} RF_W = RD</i>	<i>f_s</i>
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

factors may differ from product to product. **However, actual certified values shall be used in the design.**

1. **RF_{CR}** and **RF_{CH}** value mentioned in the above table are for 20⁰C.

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.

- 0.3 To provide a coherent reinforced soil mass, the vertical spacing of primary reinforcement shall not exceed 800 mm, in all types of reinforcement.
- 0.4 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 face 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 back face of the block.)

- 0.5 In case modular blocks are used for facia, no more than one intervening block shall be left without having primary reinforcement.
- 0.6 In case of wraparound facing for walls, the maximum spacing of reinforcing elements shall not exceed 500 mm, to protect against bulging.
- 0.7 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.
- 0.8 Reinforcement spacings worked out from the design procedures shall be configured to fit the above parameters.

A2-1.2 Where as 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

A31.1 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,

Tender document no EDFC_CGM_TDL_ROB_5C

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)	AFCOR NF-P94-270	Geotechnical Design-“Retaining structures-Reinforced and Soil nailing structures”
4)	IS:1893-Part 1	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 Aluminium and Aluminium 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

Part III

Chapter

IV

NON-DESTRUCTIVE INTEGRITY TESTING OF CONCRETE PILE

3.4 NON-DESTRUCTIVE INTEGRITY TESTING OF PILE

3.4.1 SCOPE

These specifications cover 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).

3.4.2 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.

3.4.3 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.

3.4.3.1 The Low Strain Integrity Testing

This is a system of assessing the integrity of piles by the use of low stress wave imparted to

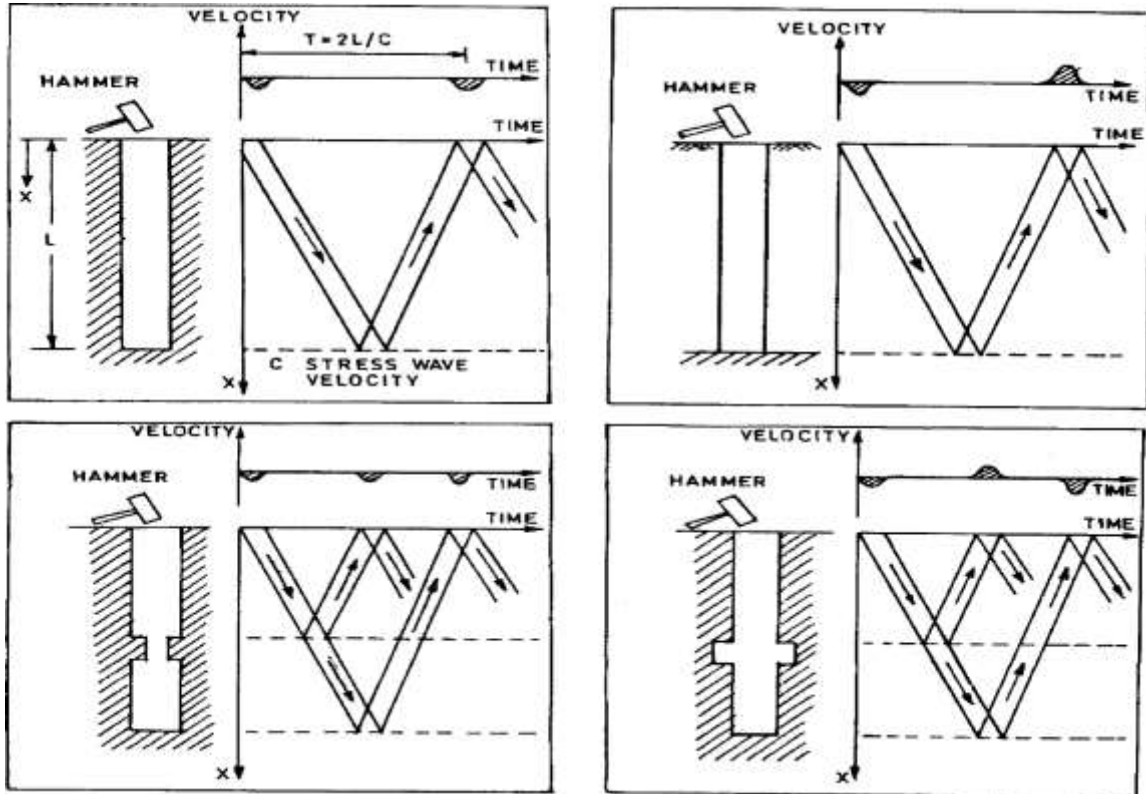
the pile shaft and is also known as Sonic Integrity or Sonic Echo Test..A small metal/hard rubber hammer is used to produce a light tap on top of the pile. The shock travelling down the length of the pile is reflected back from the toe of the pile and recorded through a suitable transducer/accelerometer (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).

- 3.4.3.2 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.
- 3.4.3.3 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.
- 3.4.3.4 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.



3.4.4 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 reflection the structural condition of piles.

3.4.5 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.

3.4.6 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 1500mm.
- (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.

3.4.7 **METHOD OF MEASUREMENTS:** It will be measured in number.

3.4.8 **PAYMENTS:** The rate includes cost of all materials, labour, equipments & operations required to do this test.

Part III

Chapter

V

PRECAUTIONS WHILE WORKING IN CLOSE PROXIMITY OF EXISTING INDIAN RAILWAY OR DFCCIL TRACK

3.5 PRECAUTIONS WHILE WORKING IN CLOSE PROXIMITY OF EXISTING INDIAN RAILWAY OR DFCCIL TRACK

3.5.1 General

Any construction activity involving the existing embankment/formation/running track of the Indian Railways or DFCCIL shall be carried out only with the prior specific authorization of the Engineer.

3.5.2 Works being executed outside running lines are further divided into following 3 sub groups depending upon their distance from the IR tracks /DFCCIL Running Tracks

- a) works being done within 3.5 meters from centre of track.
- b) works being done between 3.5 meters and 6 meters from centre of track.
- c) works being done beyond 6 meters from centre of track.

If a work site is located far away from the existing track but the vehicles in connection with the work are required to ply within the distance from centre of track as mentioned above, it will be constructed that the work in being executed under above classification.

3.5.2.1 Works being done within 3.5 meters from centre of track

All works planned within 3.5 meters from centre of running line or which involve working of machineries and vehicles within this zone, are to be done essentially under block protection and necessary safety precautions for protection of track as per para 806 and 807 of IRPWM be taken. This includes even occasional plying of vehicles/machineries for short durations.

3.5.2.2 Works being done between 3.5 meters and 6 meters from centre of track.

Following precautions be taken when works are required to be done between 3.5 meters to 6 meters from track centre or machines/vehicles are required to work/ply within this zone:

- (i) Before start of work demarcation should be done parallel to running track at a distance of 3.5 meters from centre of track in advance, as per sketch B, by 150 mm wide white line of lime. Any work or movement of machinery infringing this line will need block protection. Rail barricading should be put up at such locations, as per sketch C, to ensure that even by carelessness or oversight, vehicles do not infringe fixed dimensions. Barricading design shall be approved by the Engineer.
- (ii) In case vehicles have to ply or machineries have to work within this zone, DFCCIL's and contractor's supervisors be positioned as shown in sketch D except for the following:
 - a. Instead of a DFCCIL supervisor it would be a responsible and trained staff of the Contractor
 - b. Additional trained staff of the Contractor, shall be posted where turning of vehicles is required during working e.g. earth work bridge work, ballasting etc. Location for reversing vehicles should be nominated and it should be selected in such away that

there is no danger to running trains at such location. Such trained staff of the Contractor should be available with hand flags so that vehicles do not come closer to track by 3.5 meters. Wherever vehicles have to take turn, it should be done in such a way that the driver is invariably facing the running track at all times.

- (iii) Look out men should be posted along the track at a distance of 800 meters from location of work with red flag and to whistle in face of road vehicles and approaching trains. Look out men shall also be suitably trained staff of Contractor as mentioned in para 3.5.2.2 (ii) above.
- (iv) In additional to look out men, caution order needs to be issued to trains and speed restrictions imposed wherever considered necessary through Employer.
- (v) Arrangements should be made to protect the track in case of emergency at work site.
- (vi) All temporary arrangements required during execution should be done in a manner that moving dimension is not fringed.
- (vii) Individual vehicle/machinery shall not be left unattended at site of work. If it is unavoidable and essential to stable it near running track, it shall be properly secured and manned even during non working hours with all arrangements to protect the track from infringement.
- (viii) Any material unloaded or shifted along the track should be kept clear of moving dimensions and stacked at a specified distance from running track.
- (ix) Movement of vehicle/working of machineries should be prohibited at night. However, in case of emergency when night working unavoidable, adequate lighting shall be provided with all protection measured as mentioned above in full force. All night working near IR track shall require Engineer's prior approval.
- (x) The work site should be suitably demarcated to keep public and passengers away. Necessary signages , boards, such as "work in progress" etc should be provided at appropriate location to warn public/passengers.
- (xi) Contractor's drivers/operators handling vehicles/machineries shall be issued a fitness certificate by the safety officer of the Contractor after educating them about safety norms and after taking assurance in writing for working within vicinity of railway's track.
- (xii) While working on cuttings with machineries or when there is movement of vehicles above cutting, if there is possibility of any of the following circumstances, work has to be done under block protection:
 - (a) Any possibility exists for machinery/vehicle after toppling/due to loss of control come over track of infringe it.
 - (b) Chance of machineries/vehicles to come within 3.5 meters from track centre though working beyond it.

3.5.2.3 Works being beyond 6 meters from centre of IR track.

No precautions are needed except in cuttings or where the work can affect train running in anyway.

3.5.3 Procedure to be followed for cutting of existing IR formation

Locations where it is necessary to cut the existing IR formation for the construction of the construction of the DFC formation are classified into the following two categories:

- (a) Where the distance between the centre line of existing IR track and the proposed

DFC track is less than 8 m

(b) Where the distance between the centre line of existing IR track and the proposed DFC track is greater than or equal to 8 m

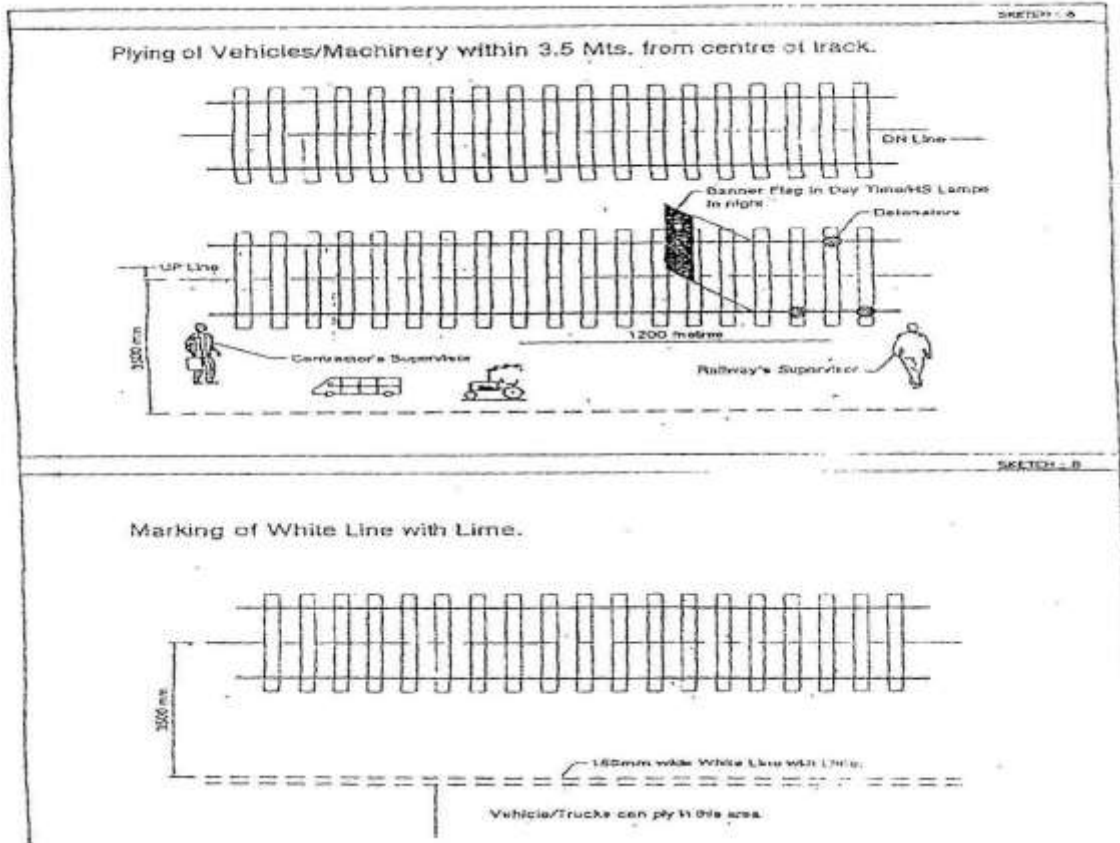
3.5.3.1 Distance between centerlines of IR DFC track is less than 8 m.

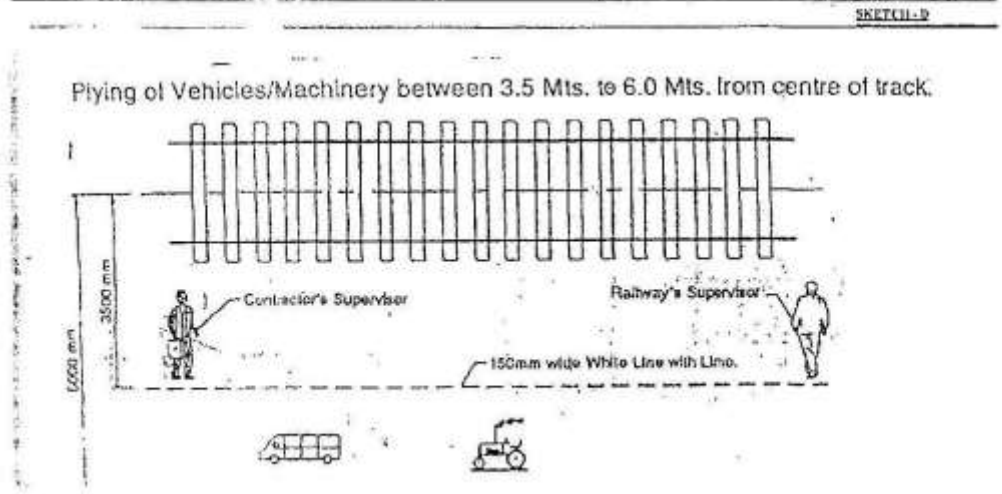
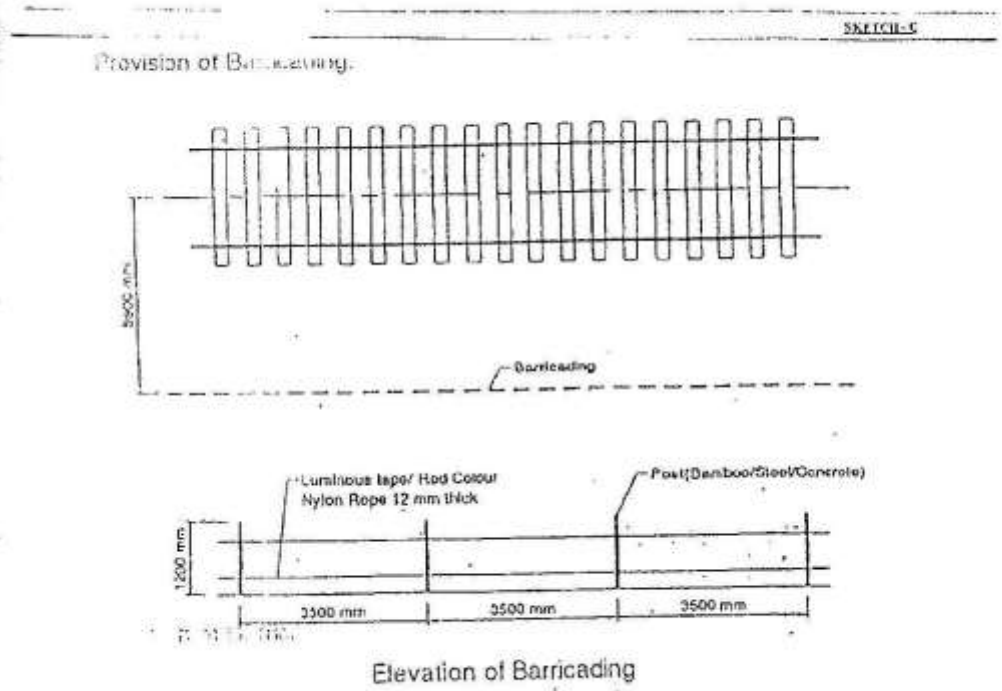
- (i) Such a situation may arise while working in existing IR yards. In such cases, if it is agreed with IR to suspend the nearest IR line for the traffic, the existing IR formation can be cut vertically at a distance of 3.8 m from the centre line of the proposed DFC track for the depth required to provide the formation layers (blanket and prepared sub grade) of the DFC track as per specifications. In case it is not agreed to suspend the traffic on nearest IR line, detailed methodology for the work will be submitted by contractor to the Engineer for the approval and work will be executed accordingly following all safety precautions.
- (ii) Due care and precautions shall be taken to avoid any slippage of the cut. In case of any slippage, damage or disturbance of the IR track or formation, the Contractor shall rectify and restore the same to its original configuration at his own cost to the satisfaction of the Engineer.
- (iii) The suspension of the IR line will not be more than two weeks and this portion of the earthwork shall be completed within this period.
- (iv) This work shall not be carried out during monsoon, during rainy days or when the IR formation is in a saturated condition.

3.5.3.2 Distance between centerlines of IR and DFC track is greater than or equal to 8 m.

- a. While constructing the bank by the side IR running track, benching of existing slope shall be done, before new earthwork is taken up, to provide proper bonding between old and new earthworks. It should be ensured that there is no humus material left on the benched slope. Care needs to be taken to avoid entry of rain water into the formation from this weak junction to avoid development of weakness in formation, slope failure, maintenance problems due to uneven settlement.
- b. Starting from the toe, benching at every 30 cm height shall be done on the sloped surface of existing IR bank as in sketch below, so as to provide proper amalgamation between old and new earthwork.

SAFETY/PROTECTION ARRANGEMENT SKETCHES





Part III

Chapter VI

CODES & SPECIFICATIONS TO BE FOLLOWED

3.6 CODES & SPECIFICATIONS TO BE FOLLOWED

3.6.1 List, though not exhaustive, of Codes / Specification with up to date corrections slip to be followed is as under:

3.6.2 Earthworks, Blanket & Ballast

- a) IS:2720 Part 2 Determination of water content.
- b) IS:2720 Part-4 Grain size analysis.
- c) IS:2720 Part-5 Determination of liquid and plastic limits.
- d) IS:2720 Part-8 Determination of water content- dry density relation using heavy compaction.
- e) IS:2720 Part-16 Laboratory determination of CBR.
- f) Ministry of Railways Guidelines for earth work in Railway Projects No.GE: G-1, July 2003
- g) Ministry of Railways Guidelines for earthwork in railway projects, Guideline No. GE: G-0014 Nov 2009.
- h) Ministry of Railway Specification for Mechanically Produced Blanketing Material For Railway Formations Including Guidelines for Laying No GE: IRS -2
- i) Ministry of Road Transport and Highways Specification for Bridge Works, 4th edition.
- j) Report on "Guidelines for Use of Geosynthetics On Railway Formation Including Specifications" (Provisional) Report No. RDSO/2007/GE: G0009(D) July 2008
- k) Concept and Design of Reinforced Earth Structures Report No. GE: R 73 June – 2005
- l) IRS-GE-1, Specifications for Track Ballast

3.6.3 Civil Structures

- a) IR 25T Loading Standards.
- b) IR Bridge Rules.
- c) IR Code of Practice for the Design of Substructures and Foundation of Bridge (Bridge Substructure and Foundation Code).
- d) IR Manual of Design and construction of Pile and Well Foundations.
- e) IR Code of Practice for Plain and Reinforced Concrete Bridge Construction (Concrete Bridge Code).
- f) IR Code of Practice for the Design of Steel Or Wrought Iron Bridges Carrying Rail, Road or Pedestrian Traffic (Steel Bridge Code),
- g) IR Codes and Specifications Welded Bridge Code
- h) BS 5400 for Bearings of Bridges
- i) DFC Schedule of Dimensions.
- j) Indian Railway Schedule of Dimensions (SOD)
- k) Indian Railway Works Manual,
- l) Indian Railway Bridge Manual
- m) IS 456- Code of Practice for Plain and Reinforced Concrete.
- n) IS 2911 (all Parts) Code of Practice for Design and Construction of Pile Foundations.
- o) IS 1493- Design of Bored and Cast Situ Piles
- p) IS 1893- Indian Seismic Code

- q) IS 1343 Code of Practice for Pre-stressed Concrete.
- r) IRS B1-2001 with latest amendment or latest version
- s) UIC 774-3R- Track / Bridge Interaction.
- t) Code of practice for Ready mix concrete - IS 4926
- u) Indian Railways Unified Standard Schedule of Rates (Formation works, Bridge Works and P.Way Works), 2019 and Indian Railways Unified Standard Specifications (Formation works, Bridge Works and P.Way Works), 2019
- v) Indian Railways Unified Standard Schedule of Rates, 2010 and Indian Railway Unified Standard Specifications (Works & Materials) Volume I & II, Engineering Department, 2010
- w) Indian Railway Concrete Bridge Code.
- x) Indian Railway Steel Bridge Code.
- y) Indian railway engineering code.
- z) Bearing design shall be as per IS/IRC code and where these codes are not available it shall be as per relevant UIC/ASTM/EN.
- aa) IRC 5, 6, 22, 24, 83 and other relevant specification.
- bb) Specification for road and bridge works, 5th Revision MORTH 2013
- cc) Relevant IS code for geo technical investigation and foundation design.

3.6.4 In case of any conflict between Technical Specification, Additional Technical Specification mentioned in Part-II and Part-III of Tender Document, Codes / Specifications mentioned above or otherwise or regarding correct applicability of relevant specification, the decision of Engineer shall be final and binding.

Part III

Chapter VII

PRIORITY OF DOCUMENTS

3.7 PRIORITY OF DOCUMENTS

3.7.1 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
2. The Letter of Award
3. The Preamble & General Instructions to Tenderers
4. The Schedules
5. Special Conditions of Contract (SCC)
6. General Conditions of Contract (GCC)
7. Technical Specifications and Additional Technical Specifications as part of Special Conditions
8. Any other documents forming part of Contract

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 08 months **(Eight months) for Construction** from the date of issue of Letter of Acceptance (LOA) 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 Letter of Acceptance by DFCCIL. The contractor shall be expected to complete the whole work ordered on the contractor within 08 (Eight 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 take action for termination of contract as per GCC.

4.1.1.2 Progress of works:

Within a period of 15 days from the issue of Letter of Acceptance, the contract shall submit a schedule for completion / program for execution of all works within the completion period stipulated in the LOA. All schedules and schedule submittals under this Contract shall be computerized by the Contractor utilizing the latest version of ORACLE PRIMAVERA P6 PROFESSIONAL PROJECT MANAGEMENT SOFTWARE, hereinafter referred to as ORACLE PRIMAVERA P6. The contractor shall submit the programme of work in the form on Primavera P6 duly identifying the resource requirement ie, resource loaded for all the activities in consistence with milestone target envisaged below. The chart shall be prepared in direct relation to the time stated as 08 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 Employer and the contractor within the limitation of 08 months as overall completion period. The program shall also indicate the dates by which the inputs required from Employer is expected and same shall be communicated to Employer for timely arrangement. The issues to be addressed and inputs required from the Employer shall be flagged and intimated to Employer well ahead of time, preferably 7 days before these are required as per program.

4.1.1.3 Monthly Progress Update:

The Contractor shall ensure that the schedule is current and accurate and is properly and timely monitored, updated and revised as project conditions may require and as required by the Contract documents. There shall be monthly update of Schedule which shall show up-to date and accurate progress of the Works, and shall forecast the completion date for activities in progress based on the contract baseline schedule. The monthly schedule update

shall be prepared by the Contractor and report shall be submitted to Employer on Monthly basis by the 5th of each month indicating progress made against each activity, resources deployed, recovery plan, if any, assistance requirement from Employer, if any.

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.

S. No.	Milestone Targets	Time allocated within which to achieve completion in total (08 months)
1.	Physical commencement of work and mobilization of resources (manpower, equipment, machinery, etc.)	D + 15 days
2.	Submission of detailed Schedule of Completion / Program of Execution	D + 15 days
3	Submission of QAP/WPSS and launching scheme drawings	D + 45 days
4.	Construction of substructure etc	D + 45 to D + 120 days
5.	Fabrication of Girders	D + 60 to D+150
6.	Erection of Composite Girders arrangement as per launching scheme etc	D + 151 to D+180
7.	Launching of Composite Girders etc.	D + 181 to D+210
8.	Construction of deck slab of BOW String Girder	D + 210 to D + 230 days
9.	Construction of drainage arrangement and misc. activities, etc.	D + 210 to D + 230 days
10.	Final Finishing and clearance/tidying up of site completely.	D + 210 to D+ 240 days

Note:

1. "D" is the date of issue of Letter of Acceptance by DFCCIL to the contractor.
6. These Milestones shall be further broken down and planned in detailed on MS Project/ Primavera.
7. Formation /Site shall be handed over to track contractor as soon as it is ready in sequential manner.

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	Bid Capacity
Form No. 2D	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
FormNo.10	Draft Agreement for JV
FormNo.11	Pro-forma of Participation from each partner of JV
FormNo.12	Power of Attorney for authorized signatory of JV
PartnersFormNo.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. 17A	Proforma of 48 Hrs Notice for Part of the Work
Form No. 18	Proforma of Termination Notice
Form No. 18A	Proforma of Termination Notice for Part of the Work
Form No. 19	Format of Bank Guarantee for
Mobilization Form No. 20	Format of Integrity pact
Form No. 21	Summary of Insurances
Form No. 22	Format for Affidavit
Form No. 23	Format for Guarantee Bonds
Form No. 24	Format for Bank Guarantee for EMD
Form No. 25	Proforma for 14 Days Notice for Offloading of Part of Contract work
Form No. 26	Proforma for Notice for Part of Contract work Offloaded
Form No.27	Certification by Arbitrators appointed under Clause 63 & 64 of General Conditions of Contract
Form No. 28	Format for Bank Guarantee for Security Deposit

OFFER LETTER

Tender No.....
Name of work.....

To,
The Chief General Manager,
DFCCIL,

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Amendments.;
- (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 of opening of Technical Bid in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (d) We have not been blacklisted/banned in accordance with para.1.3.13 (ii)(v)(a) of Preamble & 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 & 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 Earnest Money (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

Tender document no EDFC_CGM_TDL_ROB_5C

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

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 turnover 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-2D

FORM No. 2A (Part-1 of 2)

TECHNICAL ELIGIBILITY CRITERIA DETAILS

**Details of the similar works completed (as per Para1.3.13 (i) (A) (i) of
'Preamble & General Instructions to Tenderers')**

S. No.	Description	Details to be filled by Tenderer	
1	Contract Identification/ Contract Agreement No.		
2	Award date		
3	Date of Completion		
4	Role in Contract (This criterion must be fulfilled by the JV or Lead Member of JV ONLY)	Prime Contractor ┆	Member in JV ┆
5	If member in a JV, specify share of each JV member		
6	Total Contract Value of COMPLETED Single works as defined in requirement of Para 1.3.13(i)(A)(i)		
7	Total payment received against this contract before Tender Opening Date		
8	Bridge/ Viaduct for:	Railway/Metro Railways/Road Bridge	
9	Value of completed work of bridge/ROB/FOB/viaduct of Railway/Metro Railways/ Roads excluding cost of approach embankment		
10	If member in a JV, specify qualifying amount against Item-9	<i>[insert percentage]</i>	<i>[insert amount]</i>
11	Employer's Name: Address: Telephone/fax number E-mail:		
12	Description of the similarity in accordance with Criteria 1.3.13(i)(A)(i)		

The bidder shall upload Certified completion certificates issued by the client duly signed and scanned/ digitally signed as per Eligibility Criteria of the tender documents.

Signature of
the Tenderer with
Seal

Note: Use separate sheet for each work submitted in support of this criterion.

Signature of Tenderer (s) with Seal

FORM No. 2A (Part-2 of 2)**TECHNICAL ELIGIBILITY CRITERIA DETAILS****Details of the similar works completed (as per Para1.3.13 (i) (A) (ii) of 'Preamble & General Instructions to Tenderers')**

S. No.	Description	Details to be filled by Tenderer	
1	Contract Identification/ Contract Agreement No.		
2	Award date		
3	Date of Completion of contract, if complete		
4	Role in Contract	Prime Contractor ↓	Member in JV ↓
5	If member in a JV, specify percentage share of each member		
6	Type of Bridge	Open Web/Plate Steel Girder/Composite Girder/ Bow string Girder/FOB for Railway/Metro Railways/Road Bridge	
7	Number of spans and span-length completed in the relevant type of bridge		
8	Number and Length of the completed Bridge span of a Work, similar to the works as defined in requirement of Para 1.3.13 (i)(A) (ii) read along with Note, by the tenderer/JV member		
9	Date of Completion of relevant portion of contract as per Item-7		
10	Employer's Name: Address: Telephone/fax number E-mail:		
11	Description of the similarity in accordance with Criteria 1.3.13(i)(A)(ii)		

The bidder shall upload Certified completion certificates issued by the client duly signed and scanned/ digitally signed as per Eligibility Criteria of the tender documents.

Signature of
the Tenderer with
Seal

Note: Use separate sheet for each work submitted in support of this criterion.

Signature of Tenderer (s) with Seal

Reference -Para 1.3.13 (i)(B) of 'Preamble & General Instructions to Tenderers'

FINANCIAL ELIGIBILITY CRITERIA DETAILS

Each Bidder or each member of JV must fill in this form

separately. Name of Bidder/ JV Partner

Annual Contractual Turnover Data for the Previous 3/4-F.Y. Years (Contractual Payment only)			
Year	Amount Currency	Exchange Rate	Indian National Rupees Equivalent
Average Annual Contractual Turnover for last 3 years			

1. The average annual contractual turnover shall be calculated as an average of "total contractual payments" in the previous three financial years. However, in case balance sheet of the previous year is yet to be prepared/ audited, the audited balance sheet of the fourth previous year shall be considered for calculating average annual contractual turnover.
2. The information supplied shall be substantiated by data in the audited balance sheets and profit and loss accounts for the relevant years in respect of the bidder or all members constituting the bidder.
3. Contents of this form should be certified by a Chartered Accountant duly supported by Audited Balance Sheet duly certified by the Chartered Accountant.

SEAL AND SIGNATURE OF THE BIDDER

Certified that all figures and facts submitted in this form have been furnished after full consideration of all observations/notes in Auditor's reports.....

(Signature of Chartered Accountant)
 Name of CA:.....
 Registration No:.....
 (Seal)

FORM 2C

Reference -Para 1.3.13 (i)(C) of 'Preamble & General Instructions to Tenderers'

BID CAPACITY- DETAILS OF EXISTING COMMITMENT AND BALANCE WORK

Each Bidder or each member of JV must fill in this form separately.

Name of Tenderer/JV partner:

S.N.	Name of work	LOA no./ CA no.	Employer's Name/ Address/ Contact Details	Date of Award	Stipulated date of Completion	Expected Date of Completion	Value of work completed up to date of NIT	Balance value of work to be completed in 'N'	Remarks

A (Maximum value of construction works executed and payment received in any one of the previous three financial years or the current financial year (up to date of inviting tender), taking into account the completed as well as works in progress) = **Rs.....**

N (Number of years prescribed for completion of work for which bids has been invited) = **.....Years**

B (Existing commitments and balance amount of ongoing works with the tenderer as per the above format for statement of all works in progress and also the works which are awarded to tenderer but yet not started up to the date of inviting of tender) = **Rs.**

Calculated Bid Capacity of the Tenderer / JV Partner [AxNx2- 0.33xNxN] =
Rs.....

Certified that all figures and facts submitted in this form have been furnished after full consideration of all observations/notes in Auditor's reports.....

(Signature of Chartered Accountant)
Name of CA:.....
Registration No:.....
(Seal)

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

SUMMARY OF PRICES

(Summary of Prices has been separately attached in Financial Packet "B")

SCHEDULE OF PRICES & TOTAL PRICES

(Schedule of Prices & Total Prices have been separately attached in Financial Packet "B").

SAMPLE AGREEMENT

CONTRACT AGREEMENT

(To be executed on requisite value of stamp papers) AGREEMENT

This agreement is made on this Day of 2022 BY AND

BETWEEN Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a company incorporated under the companies Act, 1956 and having its office at Supreme Court Metro Station Building, Pragati Maidan, New Delhi 110001 (hereinafter referred to as "EMPLOYER" which expression shall, where the context admits, include its successors and assigns) OF THE ONE PART

AND

M/s having its office at.....(hereinafter referred to as " the Contractor" which expression shall, where the context admits, include their legal heirs, executors, administrators, successors and assigns in business) OF THE OTHER PART.

WHEREAS: -

1. The Employer is desirous that certain works should be executed by the Contractor viz. Tender No.(hereinafter called "the works", and has accepted a Bid by the Contractor for the execution and completion of such works and the remedying of any defects therein.

NOW THIS AGREEMENT WITNESSETH as follows: -

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

2. The following documents shall be deemed to form and be read and construed as part of this Agreement in the following order of priority:

- (a) The Contract agreement
- (a) The Letter of Award /Acceptance
- (b) The Preamble & General Instructions to Tenderers
- (c) The Schedules (Bill of Quantities)
- (d) Special Conditions of Contract (SCC)
- (e) General Conditions of Contract (GCC)
- (f) Technical Specifications and Additional Technical Specifications as part of Special Conditions
- (g) Any other documents forming part of Contract

3. In consideration of the payment to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respect with the provision of the contract.

4. The Employer hereby covenant to pay the Contractor in consideration of the execution and completion of the works and the remedying of defects therein the Contract Price or such other

Tender document no...

sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

- 5. Both the parties shall hereby submit to the jurisdiction of the courts situated at New Delhi for the purpose of actions and proceedings arising out of the contract and the courts at Delhi shall have the sole and exclusive jurisdiction to hear and decide such actions and proceedings.
- 6. In case any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this Agreement, but this Agreement shall be construed as if such invalid or illegal or unenforceable provision had never been contained herein.

IN WITNESS

Where of the parties hereto have caused this Agreement executed the day and year first before written.

(Name, (Name, address of the authorized signatory)	Designation Designation	and and	address Authorized	of	the signatory)
--	----------------------------	------------	-----------------------	----	-------------------

Signed for and on behalf of the Contractor in the Presence of: the presence of:	Employer in
---	-------------

Witness:

- 1.
- 2.

Witness:

- 1.
- 2.

Name and address of the witnesses to be indicated.

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 CGM/ GM Co-ord., Dedicated Freight Corridor Corporation of India Limited, 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 "thesaid contractor(s)" for the work _____(hereinafter called "the said agreement") having agreed for submission of an 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, under take to pay 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 Deputy Chief Project Manager/ FINANCE, Dedicated Freight Corridor Corporation of India Limited or CGM/ GM Co-ord, 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 notwithstanding 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

Tender document no...

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 CGM/ GM Co-ord DFCCIL (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) Notwithstanding 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 guarantee 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 completion plus 60 days beyond that). Unless extend on demand by Government. Notwithstanding anything to the contrary contained herein before, our liability under this guarantee is restricted to 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 the for _____(indicate the name of Bank)

Tender document no...

Witness

:

Signature of Bank Authorize official

(Name):

Designation

:

Full

Address.

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 CGM/ GM Co-ord DFCCIL 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 what so ever 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 CGM/ GM Co-ord 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 along 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 here after becomes due to us under the said or any other Contract.

Dated this day _____ day of _____ 200

for and on behalf of

M/s _____ (Contractor)

Signature of witness

Name of witness in Block

letter. Address.

**ECS / NEFT /
RTGSMANDATE
FORM**

Date

:-To,

Deputy Chief Project Manager /Finance,
(Name of Field Unit)

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 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

**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/shaving its registered office at (hereinafter referred to as ` ') in the capacity of a Joint Partner of the other part.

and

M/shaving its registered office at..... (hereinafter referred to as ` ') in the capacity of a Joint Partner of the other part.

The expressions of andshall wherever the context admits, 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 Amendment [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 RESPONSIBILITY

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. EARNEST MONEY (BID SECURITY)

Till the award of the work, JV firm/Lead Partner of JV firm shall furnish Earnest Money (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, manpowered the

sources.

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.....

.....

(Seal)

Witness

1(Name & Address)

2(Name & Address)

Notes: (1) In case of existing joint venture, the certified copy of JV Agreement may be finished

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
1. Liability and sharing of risks
1. Insurance
2. Sharing of Promotion and Project Costs, Profits, Losses and Remuneration
3. Financial Administration and Accounting
4. Guarantees and Bonds
5. Arbitration
6. Notices
7. 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

PROFORMA 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,

CGM/ GM Co-ord

Dedicated Freight Corridor Corporation of India Limited

Address -----

Sir,

Re: ..."[Insert name of work] "

Ref: Your notice for Invitation for Bid (IFB) No.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 authorize to act on our behalf for the purposes of submission of Bid for... and authorize to in cur 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.**

Tender document no.....

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 maybe furnished.

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 authorize Mr/Ms.....who is presently employed with us and holding the position ofas 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 ... [Name of Work] 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 here by agree to ratify all acts, deed sand 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.....

(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

Witness1:

Name:

Address:

Occupation

**Note*
s: :

Witness2:

Name:

Address:

Occupation

:

- i) To be executed by all the partners jointly, in case of a Joint Venture.

**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[Name of Work]

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/document sand generally to represent the Joint Venture in all its dealings with the Railways/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 executants (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 one 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 of2020

Tender document no.....

.....
(Signature)

..... (Name in
Block letters of Executants) Seal of
Company

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

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 _____. From the progress is 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

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

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.

7. Physical fitness _____

8. Identification marks _____

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

Tender document no....
clearly stated

**PROFORMA OF 7 DAYS NOTICE FOR WORKS AS A WHOLE/ IN
PARTS (DETAILS OF PART OF WORK TO BE MENTIONED)
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/CGM'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

**PROFORMA OF 48 HRS NOTICE FOR WHOLE
WORKDFCCIL**
(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

PROFORMA OF 48 HRS NOTICE FOR PART OF THE WORK

_____ **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 part of work.....(details of part to be mentioned).
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 part of work(details of part to be mentioned) in contract will be rescinded and the work under this contract will be carried out independently without your participation.
3. Your full Performance Guarantee for the Contract shall be forfeited and you shall not be issued any completion certificate for the contract. However, no additional Performance Guarantee shall be required for balance work being executed through the part terminated contract.
4. The contract value of part terminated contract shall stand reduced to

Kindly acknowledge receipt.

Yours faithfully

For and on behalf of the
Employer Name of the Official:-
Stamp/Seal of the Employer

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

**PROFORMA OF TERMINATION NOTICE FOR PART OF THE WORK
(DETAILS OF PART OF WORK TO BE
MENTIONED)**

_____ **DFCCIL**
(Without Prejudice)

No. _____ Dated _____

To
M/s _____

Dear Sir,

Contract Agreement No. _____
In connection with _____

1. 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 part of work.....(details of part of work to be mentioned)
2. Your above part of work in contract.....(details of part of work to be mentioned)stands rescinded in terms of Clause 62 of Standard General Conditions of Contract and the same 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.
3. Your full Performance Guarantee for the Contract shall be forfeited and you shall not be issued any completion certificate for the contract. However, no additional Performance Guarantee shall be required for balance work being execute through the part terminated contract.
4. The contract value of part terminated contract shall stand reduced to

Kindly acknowledge receipt.

Yours faithfully

For and on behalf of the
Employer Name of the Official:-
Stamp/Seal of the Employer

**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 ofhereby 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 fulfill 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.

Tender document no....

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

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.

NOW, THEREFOR,

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. 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

Tender document no....

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) is 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 commit 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 disfavor 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 defense 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 tender process or the contract, if already awarded, can be terminated for such reason.
5. Earnest Money (Security Deposit)
- 5.1 The 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 than 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 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 same 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.

Tender document no....

- 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

Tender document no....

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 extend 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 EXECUTIVE 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 may be

[B]- To be replaced by contract/supply contract/consultancy contract/works contract as the case was may be.

SUMMARY OF INSURANCES
(Clause 1.5.12, Part - I, Chapter - V)

Insurance to be taken by the Contractor

In accordance with the provision of SCC Sub-Clause 1.5.12, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurance set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, such approval not to be unreasonably withheld.

A. Insurance against Injuries to Person and Damage to property-

Covering any loss, damage, death or bodily injuries which may occur to any physical property or to any person / animal covering loss and damage to Employer property and Employer's personal.

Amount (In Rs)	Deductible limits (in Rs.)	Parties insured (names)	From	To
Rs. 100 Lakh per occurrence with no limit on the number occurrences	-	Contractor and Employer	Commencement date	Issue of Performance certificate

B. Insurance of Works and Contractor's equipments-

The contractor shall insure to cover loss or damage to works, plants, materials and contractor's documents occurring prior to completion of the work until the date of issue of the Taking-Over Certificate for the Works.

Amount (In Rs)	Deductible limits (in Rs.)	Parties insured (names)	From	To
Full replacement value, including delivery to Site plus 15% of replacement cost	-	Contractor and Employer	Commencement date	Issue of Taking-Over Certificate for the Works

C. Insurance for Contractor's Personnel

The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel. The Employer and the Engineer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

D. Automobile Liability Insurance

Covering use of all vehicles used by the contractor or its sub contractors (whether or not owned by them) in connection with the design, construction testing and commissioning of the facilities under the contract in accordance with statutory requirements.

E. Professional Indemnity Insurance

To cover professional negligence in the design of the works.

Amount (In Rs)	Deductible limits (in Rs.)	Parties insured (names)	From	To
Rs. 50 Lakh	-	Contractor and Employer	Commencement date	Issue of Performance certificate plus 3 years

F. Workers' Compensation

In accordance with the statutory requirement applicable in India.

G. Insurance to be taken by the Employer (DFCCIL)– Nil

FORMAT FOR AFFIDEVIT TO BE UPLOADED BY TENDERER ALONGWITH THE TENDER DOCUMENT

(Clause 1.3.13(iii), Part - I, Chapter - III)

(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 ofas per the tender No..... of DFCCIL, do hereby solemnly affirm and state on the behalf of the tenderer including its constituents as under:

1. I/we the tenderer(s), am/are signing this document after carefully reading the contents.
2. I/we the tenderer(s) also accept all the conditions of the tender and have signed all the pages in confirmation thereof.
3. I/we hereby declare that I/we have downloaded the tender document from the website <https://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 evolution of tenders, execution of work of final payment of the contract, the master copy available with the DFCCIL shall be final and binding upon me/us.
4. 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.
5. **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.**
6. **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.**
7. 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.
8. 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 Public

FORMAT FOR GURANTEE BONDS

(a) GUARANTEE BOND FOR REINFORCED EARTH WALL SYSTEM

The agreement made this _____ day of _____ 202_ between M/s _____ (hereinafter called the Guarantor of the one part) and the Managing Director, Dedicated Freight Corridor Corporation of India Ltd. acting through Chief General Manager / General Manager Co-ordination (hereinafter called the DFCCIL of other part)

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated _____ made between the GUARANTOR OF THE ONE part and the DFCCIL of the other part, whereby the Guarantor who is the Contractor interalia undertook the work of construction of ROB work at " _____".

In the said contract the item of reinforced earth wall system is to be provided and installed by the Guarantor/Contactor as per the standard specifications of MoRTH (Ministry of Road Transport and Highways). Further the scope of detailed design of the reinforced earth wall system to serve the minimum life of 25 years (to be reckoned from the date after the maintenance period) is within the purview of the Contractor.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said reinforced earth wall system will remain satisfactorily functional for twenty five years to be reckoned from the date after the maintenance period, prescribed in the contract, expires.

During this period of guarantee, the Guarantor shall make good all defects and for that matter shall replace at his risk and cost such elements of the joints including cost of installation and fixing of the reinforced earth wall system to the satisfaction of the Engineer-In-Charge, at his own cost and he shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer In-charge calling upon him to rectify the defects, failing which the work shall be got done by the Department through some other contractor at the Guarantor's cost and risk. The decision of the Engineer-In-charge as to the cost, payable by the Guarantor shall be final and binding.

That if Guarantor fails to execute the replacement/rectification or commits breach thereunder, then the Guarantor will indemnify the Principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the Guarantor in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and/or cost incurred by the DFCCIL, the decision of the Engineer-In-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Guarantor _____ and Chief General Manager/General Manager Co-ordination, DFCCIL for and on behalf of the Managing Director, DFCCIL on the day, month and year first above written.

Signed, sealed and delivered by Guarantor
In the presence of

- 1.
- 2.

(Guarantor)

Signed for and on behalf of Chief General Manager/General Manager Co-ordination, DFCCIL by Dy. CPM
In the presence of

- 1.
- 2.

FORM No. 23

FORMAT FOR GURANTEE BONDS

**(b) GUARANTEE BOND FOR
BEARINGS**

The agreement made this ----- day of-----Two Thousand Eighteen between M/s----- (hereinafter called the Guarantor of the one part) and the Managing Director, Dedicated Freight Corridor Corporation of India Ltd. Acting through CGM/ GM Co-ord DFCCIL (hereinafter called the DFCCIL of other part)

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated----- made between the GUARANTOR OF THE ONE part and the **DFCCIL** of the other part, whereby the Guarantor who is the Contractor interalia undertook the work of RFO at "-----

In the said contract the item of ROCKER/ROLLER, POT/PTFE or ELASTOMERIC type of bearings is to be provided and fixed by the Guarantor/Contractor as per the standard specifications and following the basic design requirements as per detailed design report of the DFCCIL. Further the scope of detailed design of the bearings to serve the minimum life of 50 years (to be reckoned from the date after the maintenance period) is within the purview of the Contractor.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said bearings will remain satisfactorily functional for twenty-five years to be reckoned from the date after the maintenance period, prescribed in the contract, expires.

During this period of guarantee, the guarantor shall make good all defects and for that matter shall replace at his risk and cost such elements of the joints i/c cost of installation and fixing of the bearings to the satisfaction of the Engineer-In-Charge, at his cost and he shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer-In-Charge calling upon him to rectify the defects, failing which the work shall be got done by the Department through some other contractor at the GUARANTOR's cost and risk. The decision of the Engineer-In-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the replacement/rectification or commits breach thereunder, then the Guarantor will indemnify the Principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the Guarantor in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the DFCCIL, the decision of the Engineer-In-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Guarantor-----and Chief Project Manager, DFCCIL for and on behalf of the Managing Director, DFCCIL on the day, month and year first above written.

Signed, sealed and delivered by Guarantor in the presence

of 1.

3.

(Guarantor)

Signature of Tenderer (s) with Seal

Page 253 of 253

Tender document no....

Signed for and on behalf of General Manager, DFCCIL by Dy. C.P.M/DFCCIL, in the
presence of 1

2

(Dy. C.P.M)

Earnest Money (Bid Security)/ Security Deposit

Bank Guarantee Bond from any scheduled commercial bank of India
(On non-judicial stamp paper, which should be in the name of the Executing Bank).

..... **Bank's Name, and Address of Issuing Branch or Office**

Beneficiary: Dedicated Freight Corridor Corporation of India Limited.

Date:.....

Bank Guarantee Bond No.:

Date:-----

..... **(Designation & address of Contract Signing Authority)**,
Dedicated Freight Corridor Corporation of India Limited (herein called "the Employer") having invited the bid for ----- through Notice inviting tender (NIT) No. -----, We have been informed that
. **[Insert name of the Bidder]** ----- (**hereinafter called "the Bidder"**)
intends to submit its bid (hereinafter called "the Bid") .

WHEREAS, the Bidder is required to furnish Earnest Money (Bid Security) / Security Deposit for the sum of **[Insert required Value of Earnest Money (Bid Security) / Security Deposit]**, in the form of Bank Guarantee, according to conditions of Bid.

AND

WHEREAS, **[Insert Name of the Bank]**, with its Branch **[Insert Address]** having its Headquarters office at..... **[Insert Address]**, hereinafter called the **Bank**, acting through **[Insert Name and Designation of the authorised persons of the Bank]**, have, at the request of the Bidder, agreed to give guarantee for Earnest Money (Bid Security) / Security Deposit as hereinafter contained, in favour of the Employer:

1. KNOW ALL MEN that by these present that I/We the undersigned **[Insert name(s) of authorized representatives of the Bank]**, being fully authorized to sign and incur obligations for and on behalf of the Bank, confirm that the Bank, hereby, unconditionally and irrevocably guarantee to pay to the Employer full amount in the sum of **[Insert required Value of Earnest Money (Bid Security)/ Security Deposit]** as above stated.
2. The Bank undertakes to immediately pay on presentation of demand by the Employer any amount up to and including aforementioned full amount without any demur, reservation or recourse. Any such demand made by the Employer on the Bank shall be final, conclusive and binding, absolute and unequivocal on the Bank notwithstanding any disputes raised/ pending before any Court, Tribunal, Arbitration or any Authority or any threatened litigation by the Bidder or Bank.
3. The Bank shall pay the amount as demanded immediately on presentation of the demand by Employer without any reference to the Bidder and without the Employer being required to show grounds or give reasons for its demand of the amount so demanded.
4. The guarantee hereinbefore shall not be affected by any change in the constitution of the Bank or in the constitution of the Bidder.
5. The Bank agrees that no change, addition, modifications to the terms of the Bid document or to any documents, which have been or may be made between the Employer and the Bidder, will in any way absolve the Bank from the liability under this guarantee; and the Bank, hereby,

Tender document no....

waives any requirement for notice of any such change, addition or modification made by Employer at anytime.

- 6. This guarantee will remain valid and effective from.....***[insert date of issue]*** till***[insert date, which should be minimum (90 days beyond the expiry of validity of Bid/ 60 days beyond the Maintenance period)]***. Any demand in respect of this Guarantee should reach the Bank within the validity period of Bid Security/Maintenance period plus 60 days.
- 7. The Bank Guarantee is unconditional and irrevocable.
- 8. The expressions Bank and Employer herein before used shall include their respective successors and assigns.
- 9. The Bank hereby undertakes not to revoke the guarantee during its currency, except with the previous consent in writing of the Employer. This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No.758.
- 10. The Bank hereby confirms that it is on the SFMS (Structured Financial Messaging System) and shall invariably send the advice of this Bank Guarantee to the following bank details –

IFSC CODE	
IFSC TYPE	
BANK NAME	
BRANCH NAME	
CITY NAME	
ADDRESS	
DISTRICT	
STATE	
BG ENABLED	

- 11. The Guarantee shall be valid in addition to and without prejudice to any other security Guarantee(s) of Bidder in favour of the Employer. The Bank, under this Guarantee, shall be deemed as Principal Debtor of the Employer.

Date

Place.....

Bank's Seal and authorized signature(s)

[Name in Block letters]

[Designation with Code No.].....

[P/Attorney] No.

Witness:

1 Signature, Name & Address & Seal

2 Signature, Name& address & Seal

Bank's

Tender document no....
Seal

[P/Attorney]No.

Note: All italicized text is for guidance on how to prepare this bank guarantee and shall be deleted from the final document.

FORM No. 25
(Reference Clause 40(A))
Registered Acknowledgement Due

PROFORMA OF 14 DAYS NOTICE FOR OFFLOADING OF PART OF CONTRACT WORK

Dedicated Freight Corridor Corporation of India Ltd.
(Without Prejudice)

To

M/s
.....

Dear Sir,

Contract Agreement No.

In connection with

In spite of repeated instructions to you by the subordinate offices as well as by this office through various letters of even no....., dated.....; you have failed to show adequate progress of work so as to complete the contract within the original / extended date of completion of contract and part(s) of contract work are yet to be started/ still lagging behind the agreed program of work, listed as under:

(Details of part(s) of work which is delayed and can be executed independently, to be mentioned).

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 14 days' notice in accordance with Clause 40A of the Standard General Conditions of Contract to deploy adequate resources i.e. *(the details of resource requirement, to be mentioned)* and commence / to make good the progress for part(s) of works detailed above, failing which action as provided in Clause 40A of the Standard General Conditions of Contract shall be commenced after expiry of 14 days' notice period viz. to offload few/ all part(s) of work mentioned above to any of the existing or new contractor without your participation and at your Risk & Cost, not exceeding the value of Performance Guarantee of this contract, which may please be noted.

Kindly acknowledge receipt.

Yours faithfully

For and behalf of the Employer
Name of the

Signature of Tenderer (s) with Seal

Page 257 of 257

Official:-

Stamp/ Seal of the Employer

FORM No. 26

(Reference Clause 40(A)
Registered Acknowledgement Due

NOTICE FOR PART OF CONTRACT WORK OFFLOADED

Dedicated Freight Corridor Corporation of India Ltd.
(Without Prejudice)

To

M/s
.....

Dear Sir,

Contract Agreement No.
In connection with

1. Fourteen days' notice under Clause 40A of the Standard General Conditions of Contract was given to you under this office letter of even no., dated ; but you have taken no/inadequate action to deploy adequate resources to commence the part(s) of work/show adequate progress of the part(s) of work, mentioned therein.

As you have failed to abide by the instructions issued to commence the part(s) of work/show adequate progress of the part(s) of work even at the lapse of 14 days' notice period under Clause 40A of the Standard General Conditions of Contract, few part(s) of the work under the contract have been offloaded and being executed by other mode(s) at the cost detailed below:

Or,

1. Please refer your request letter no..... dated, wherein it was requested under clause 40 A of the Standard General Conditions of Contract to offload part(s) of works at your risk & cost. The details of part(s) of the work under the contract which have been offloaded and being executed by other mode(s) at the cost detailed below:

(List of Part(s) of work offloaded, Details of mode of execution of such offloaded work along with approximate cost thereof to be mentioned)

2. The final measurement of work(s) already executed for above part(s) of work recorded as per clause 45 (A) or/and 45 (B) of the Standard General Conditions of Contract is enclosed herewith.

3. The Bill(s) of Quantities for Part(s) of work offloaded is enclosed herewith.

Tender document no....

4. The additional cost in execution of offloaded work through mode(s) mentioned in para (1) above is determined as Rs....., over& above the cost of execution under this contract (including the PVC amount payable as per contract, as on the date of issue of this notice). This additional cost shall be recovered from your next on account bill(s) or any other dues payable to you under contract.

5. The Contract value gets reduced to Rs.....:

6. You are requested to continue with the balance work in the contract subsequent to offloading of above part(s) of work.

Kindly acknowledge receipt.

Yours faithfully

For and behalf of the Employer
Name of the

Official:-

Stamp/ Seal of the Employer

FORM No. 27

Reference Para 64.(3)

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

1. Name:
2. Contact Details:
3. Prior experience (Including Experience with Arbitrations):
4. Total Number of Arbitration/DAB/Conciliation Cases presently involved as Arbitrator/DAB Member/Conciliator:
5. Total Number of Arbitration/DAB/Conciliation Cases in which acting as Contractor's (one of the Party to the present dispute) nominee Arbitrator/DAB Member/Conciliator:
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.

Tender document no....

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:

Security Deposit

Bank Guarantee Bond from any scheduled commercial bank of India

(On non-judicial stamp paper, which should be in the name of the Executing Bank).

.....**Bank's Name, and Address of Issuing Branch or Office**.....

Beneficiary: Dedicated Freight Corridor Corporation of India Limited.

Date:.....

Bank Guarantee Bond No.:

Date:-----

..... **(Designation & address of Contract Signing Authority)**, Dedicated Freight Corridor Corporation of India Limited (herein called "**the Employer**") having invited the bid for through Notice inviting tender (NIT) No., We have been informed that **[Insert name of the Bidder]** **(hereinafter called "the Bidder")** intends to submit its bid (hereinafter called "the **Bid**").

WHEREAS, the Bidder is required to furnish Security Deposit for the sum of **[Insert required Value of Security Deposit]**, in the form of Bank Guarantee, according to conditions of Bid.

AND

WHEREAS, **[Insert Name of the Bank]**, with its Branch **[Insert Address]** having its Headquarters office at..... **[Insert Address]**, hereinafter called the **Bank**, acting through **[Insert Name and Designation of the authorised persons of the Bank]**, have, at the request of the Bidder, agreed to give guarantee for Bid Security (Bid Security) / Security Deposit as hereinafter contained, in favour of the Employer:

1. KNOW ALL MEN that by these present that I/We the undersigned **[Insert name(s) of authorized representatives of the Bank]**, being fully authorized to sign and incur obligations for and on behalf of the Bank, confirm that the Bank, hereby, unconditionally and irrevocably guarantee to pay to the Employer full amount in the sum of **[Insert required Value of Security Deposit]** as above stated.
2. The Bank undertakes to immediately pay on presentation of demand by the Employer any amount up to and including aforementioned full amount without any demur, reservation or recourse. Any such demand made by the Employer on the Bank shall be final, conclusive and binding, absolute and unequivocal on the Bank notwithstanding any disputes raised/ pending before any Court, Tribunal, Arbitration or any Authority or any threatened litigation by the Bidder or Bank.
3. The Bank shall pay the amount as demanded immediately on presentation of the demand by Employer without any reference to the Bidder and without the Employer being required to show grounds or give reasons for its demand of the amount so demanded.
4. The guarantee hereinbefore shall not be affected by any change in the constitution of the Bank or in the constitution of the Bidder.
5. The Bank agrees that no change, addition, modifications to the terms of the Bid document or to any documents, which have been or may be made between the Employer and the Bidder, will in any way absolve the Bank from the liability under this guarantee; and the Bank, hereby, waives any requirement for notice of any such change, addition or modification made by Employer at any time.
6. This guarantee will remain valid and effective from..... **[insert date of issue]** till **[insert date, which should be minimum 60 days beyond the Maintenance period]**. Any demand in respect of this Guarantee should reach the Bank within the validity period of Bid

Tender document no....

Security/Maintenance period plus 60 days.

- 7. The Bank Guarantee is unconditional and irrevocable.
- 8. The expressions Bank and Employer herein before used shall include their respective successors and assigns.
- 9. The Bank hereby undertakes not to revoke the guarantee during its currency, except with the previous consent in writing of the Employer. This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No.758.
- 10. The Bank hereby confirms that it is on the SFMS (Structured Financial Messaging System) and shall invariably send the advice of this Bank Guarantee to the following bank details -

IFSC CODE	
IFSC TYPE	
BANK NAME	
BRANCH NAME	
CITY NAME	
ADDRESS	
DISTRICT	
STATE	
BG ENABLED	

- 11. The Guarantee shall be valid in addition to and without prejudice to any other security Guarantee(s) of Bidder in favour of the Employer. The Bank, under this Guarantee, shall be deemed as Principal Debtor of the Employer.

Date

Place.....

Bank's Seal and authorized signature(s)

[Name in Block letters]

[Designation with Code No.].....

[P/Attorney] No.

Witness:

1 Signature, Name & Address & Seal

2 Signature, Name& address & Seal
Seal

Bank's

[P/Attorney]No.

Note: All italicized text is for guidance on how to prepare this bank guarantee and shall be deleted from the final document.

Tender document no....

DRAWINGS

**PART V
DRAWING
S
(Sample)**

5.1 General Arrangement Drawings with Key Plan:

S No.	ROB at LC No.	IR Chainage in KM	Between Station IR	Span Configuration	General Arrangement Drawing
01	5C	1090/27-1091/01	Kanchausi-Phapund Station	1X60	NCR/ENGG/GAD/ROB/06-2022

Notes:

1. The General Arrangement Drawings are attached as a part of tender document.
2. These GADs are indicative and for reference only.
3. The Reference Drawings are standard drawings issued by RDSO/DFCCIL. The tenderer shall scrutinize these drawings before tendering and procure a copy of these drawings for use.
4. The work shall be done as per approved final / detailed drawings.

Tender document no....

****** END OF TECHNICAL BID PACKET-A ******