

(A GOVT. OF INDIA ENTERPRISE)
27, RAJENDRA NATH MUKHERJEE ROAD,
KOLKATA-700001(WEST BENGAL)
Phone: (033) 2248 5841-44; Fax: (033) 2210 3961
E-MAIL: info@bbjconst.com, Website: www.bbjconst.com

TENDER DOCUMENT
Under
(Two Packet System)

NAME OF THE WORK: FABRICATION, SUPPLY, ERECTION AND COMPLETING OF SUPERSTRUCTURE FOR BRIDGE NO. 2 & 3 (IN SUMBER STATION YARD) AND BRIDGE NO. 61 (OVER TATSUN NALLAH) ON KATRA-QAZIGUND SECTION OF UDHAMPUR-SRINAGAR-BARAMULLA NEW BG RAILWAY LINE PROJECT. (PACKAGE: BRIDGE NO. - 2, 3 & 61) (Two Packet System).

- (b) TENDER NO. eNIT/DGM(P-V)/Br.No.2,3&61/J&K/2149/3130/R1/54-2017
- (c) Cost of Tender Form (non refundable) : Rs.10,000.00 (Tender document to be downloaded from internet site, cost of which to be deposited along with the Technical bid)
- (d) Approx. Value of the work (Tender Value) : Rs.80,73,65,056.00
- (e) Earnest money to be deposited : Rs.20,00,000.00 (To be deposited along with the Technical bid)
- (f) Completion period of the work : 20 (Twenty) months
- (g) Date of closing : 30.08.2017
- (h) Date of opening : 31.08.2017

TWO PACKET SYSTEM e-TENDER
TECHNICAL BID DOCUMENT

TENDER NO. eNIT/DGM (P-V)/Br.No.2, &61/J&K/2149/3130/R1/54-2017

TWO PACKET SYSTEM e-TENDER FOR - FABRICATION, SUPPLY, ERECTION AND COMPLETING OF SUPERSTRUCTURE FOR BRIDGE NO. 2 & 3 (IN SUMBER STATION YARD) AND BRIDGE NO. 61 (OVER TATSUN NALLAH) ON KATRA-QAZIGUND SECTION OF UDHAMPUR-SRINAGAR-BARAMULLA NEW BG RAILWAY LINE PROJECT (PACKAGE: BRIDGE - 2, 3 & 61).

LAST DATE FOR UPLOADING e-BID IN CPP'S PORTAL IS UPTO 15.00 HRS. OF 30.08.2017.

NAME & ADDRESS OF THE TENDERER(S) TO WHOM FORM SOLD

FOR EARNEST MONEY DEPOSIT (EMD):

DEMAND DRAFT No. _____ Date _____
ISSUED BY BANK _____
AMOUNT IN Rs. 20,00,000.00 (RUPEES TWENTY LAC ONLY) drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata.

FOR COST OF TENDER (NON REFUNDABLE):

DEMAND DRAFT No. _____ Date _____
ISSUED BY BANK _____
AMOUNT IN Rs. 10,000.00 (RUPEES TEN THOUSAND ONLY) drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata.

CERTIFIED THAT THIS DOCUMENT CONTAINS 160 PAGES SERIALLY NUMBERED INCLUDING COVER PAGE

Tender Document (Technical Bid Document)

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SECTION--I
e-PROCUREMENT NOTICE

SECTION - I

TENDER NO. eNIT/ DGM (P-V)/Br.No.2, 3&61/J&K/2149/3130/R1/54-2017

BBJ invites sealed Open e-Tenders under Two Packet System for the under noted work:

Name of work:	FABRICATION, SUPPLY, ERECTION AND COMPLETING OF SUPERSTRUCTURE FOR BRIDGE NO. 2 & 3 (IN SUMBER STATION YARD) AND BRIDGE NO. 61 (OVER TATSUN NALLAH) ON KATRA-QAZIGUND SECTION OF UDHAMPUR-SRINAGAR-BARAMULLA NEW BG RAILWAY LINE PROJECT. (PACKAGE: BRIDGE- 2, 3 & 61) (Two Packet System).	
Approx Cost of the work (Tender Value)	Rs. 80,73,65,056.00	
Earnest Money Deposit (EMD) The tenderer should furnish the details of postal address with PIN Code along with FAX No. of concerned bank from which EMD purchased.	Rs. 20,00,000.00 (Rupees Twenty Lac only) Demand Draft drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata. TENDER SUBMITTED WITHOUT EARNEST MONEY DEPOSIT (EMD) WILL BE SUMMARILY REJECTED	
Completion period of the work	20 (Twenty) months from date of issue of Lol/Work order, which ever is earlier.	
Cost of Tender Form (Document)	Rs. 10,000.00 (Rupees Ten Thousand only) as Demand Draft drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata.	
Mode of submission	Online through e-Procurement of CPP Portal, NIC	
Validity of Offer:	120 days from the date of opening of tender.	
Date & Time Schedule	Date of publishing e-NIT & Tender Document	31.07.2017 - 12.00 Hrs
	Document download start date	31.07.2017 - 13.00 Hrs
	Start date of Uploading of bid document	21.08.2017 – 10.00 Hrs
	End date of Uploading of bid document	30.08.2017 – 15.00 Hrs
	Date of opening of Technical bid	31.08.2017 – 15.00 Hrs
	Date of opening of Financial bid	To be notified later
Site Visit	It is deemed that the bidder has acquainted himself with the site condition thoroughly after site visit and quoted his rate taking into consideration all the aspects. Any plea regarding ignorance about site condition shall not be entertained.	

TENDER SUBMITTED WITHOUT EARNEST MONEY DEPOSIT (EMD) & COST OF TENDER WILL BE REJECTED.

JVs or Consortiums will not be allowed and wherever Joint Venture or Consortiums is appearing in this tender that should be considered as deleted.

1.0 The Technical Eligibility Criteria will be as under:

a. Technical Criteria:

The contractor should possess the experience of having successfully completed "similar works" during the last 7 (seven) years (ending last day of the month previous to the one in which tenders are invited) which should be any one of the following:-

- i) Three similar completed works each costing not less than the amount equal to 30% of the estimated cost.
- ii) Two similar completed works each costing not less than the amount equal to 40% of the estimated cost.
- iii) One similar completed work costing not less than the amount equal to 65% of the estimated cost.

Works are considered similar if technology, equipment etc. required are similar.

Following will be considered as "Similar Work" – **"Fabrication, Transportation & Erection of Superstructure of 'Steel or Composite' girder for Bridge/Viaduct for Motorable Road / Railway including Metro Rail"**.

b. Financial Criteria:

- i) **The average annual financial turnover during the last 3 (three) years ending as on 31.03.2017 should be at least 30% of the estimated cost.**
- ii) **The Contractor should have positive Net Worth.** This will be judged from the audited Balance Sheet as on 31.03.2017.

Note: The financial turnover & positive Net Worth shall be judged from Annual Reports consisting of Balance Sheet & Profit & Loss Statement. If Annual Account for 2016-17 is under preparation, Chartered Accountant's (signed with registration no.) certificate is to be submitted for Annual turnover & Net worth in favour of the bidder's company for 2016-17.

- c. The Contractor should submit performance certificates in reference to Sl. no. (a) above (minimum 3 nos, 2 nos, or 1 no. as the case may be) **issued by Government organizations / Semi-Government organizations / Public Sector Undertakings / Autonomous Bodies/ Municipal Bodies / Public Limited Company listed on BSE / NSE** for having successfully completed similar works in the last 7 (seven) years. **Certificates issued by such public limited company must be supported by Tax Deducted at Source (TDS) Certificates in evidence of the value of the work and the bidder shall also submit documentary proof that such public limited company was listed on BSE/NSE when the work was executed.**

- d. The bidder shall sign the Affidavit as per enclosed format.

- e. The bidder shall submit required document that they have sufficient number of Tools & Plants required for execution of work and numbers of key personnel (Technical.) to be deployed by them as indicated in the Tender document. Appropriate action will otherwise be taken as per Tender condition.

2.0 The complete tender document consists of two parts i.e. **Part-I (Technical e-Bid document) & Part-II (Price e-Bid document).**

Scanned copy of the EMD, Cost of Tender and other document, as mentioned in this tender document, are to be uploaded in CPP's portal (<https://eprocure.gov.in/eprocure/app>) within the end date of submission of e-bid.

Properly filled up PRICE SCHEDULE / BILL OF QUANTITIES (BOQ) is to be uploaded in CPP's website (<https://eprocure.gov.in/eprocure/app>). Price bid of only those bidders will be opened whose Techno-commercial offers are found to be qualified and acceptable to BBJ.

- 3.0 JOINT VENTURE will not be permitted in this Tender.**
- 4.0 PARTNERSHIP FIRM:** In case the tenderer is a partnership firm, the work experience, solvency and turn over shall be in the name of partnership firm only.
- 5.0 VALIDITY OF TENDER = 120 days from the date of opening of Tender.**
- 6.0** The tender documents can be downloaded from (<https://eprocure.gov.in/eprocure/app>)
- 7.0** (a) The tender Document will also be available in the website www.bbjconst.com during the above mentioned period and same can be downloaded.
- (b) Only scanned copy of Earnest Money Deposit Rs. 20,00,000.00 and the cost of Tender document Rs.10,000.00 should be uploaded in the e-tender portal and the same, as physical instrument, should be submitted into BBJ's office before opening date of e-tender, otherwise bidder's tender will be summarily be rejected.
- (c) BBJ Administration will not be responsible for any delay / difficulties / inaccessibility of the downloading facility for any reason whatsoever. In case of any discrepancy between the tender documents downloaded from internet and the master copy available in the offices, the latter shall prevail and will be binding on the tenderer(s). No claim on this account will be entertained.
- (d) The tenderer(s) should make their own arrangement for the site visit.
- 8.0 Earnest Money & Cost of tender shall have to be deposited by all tenderers. Tenders not accompanied by above instrument shall be summarily rejected. The tenderer should furnish the details of postal address with PIN Code along with FAX No. of concerned bank from which EMD purchased.**
- 9.0** All documents being submitted by the tenderer(s) along with their offer shall have to be attested by the Gazetted Officer **OR** all the documents submitted by the tenderer along with the tender document must be self attested with official signed failing which, document not bearing self attested signature of the tenderer, will be treated null and void and will not be taken into consideration while deciding the tender.
- 10.0** Tenderer(s) should submit the following details with tender documents:
- (a) **List of Personnel available on hand and proposed** to be engaged for the subject work as per attached format.
- (b) **List of Plant & Machinery available on hand (own) and proposed** to be inducted (owned and hired to be given separately) for the subject work as per attached format.
- (c) **List of works completed in the last 7** (seven) financial years giving description of work, organization for whom executed, approximate value of contract at the time of award, date of award and date of scheduled completion of work, date of actual start and actual completion of the work and final value of contract/final payment made to the contractor as per attached format.
- (d) **List of works on hand** indicating description of work, date of award, contract value, and approximate value of balance work yet to be done.
- Notes: (i) In case of items (c) and (d) above, supportive documents / certificates from the Organizations with whom they worked/are working should be enclosed.
- (ii) Certificates from private individuals for whom such works are executed/being executed will not be accepted.
- (iii) Tenderer(s) are advised to submit those documents, which clearly show the fulfillment of Eligibility Criteria.
- 11.0** The tenderer has to give name and contact numbers of key personnels fully and clearly in the box provided above.
- 12.0 Submission of Tender:** (Regulations for guideline of tenderers) The complete tender document to be uploaded in <https://eprocure.gov.in/eprocure/app> and only EMD & cost of tender, as physical instrument, should be submitted in BBJ's Head Office at Kolkata.

SECTION - II

DECLARATION FROM TENDERERS

Issued to: [Name & address of the bidder to be provided here]

TENDER NO: eNIT/DGM(P-V)/Br.No.2,3&61/J&K/2149/3130/R1/54-2017
DATED: 31.07.2017

NAME OF THE WORK: FABRICATION, SUPPLY, ERECTION AND COMPLETING OF SUPERSTRUCTURE FOR BRIDGE NO. 2 & 3 (IN SUMBER STATION YARD) AND BRIDGE NO. 61 (OVER TATSUN NALLAH) ON KATRA-QAZIGUND SECTION OF UDHAMPUR-SRINAGAR-BARAMULLA NEW BG RAILWAY LINE PROJECT. (PACKAGE: BRIDGE- 2, 3 & 61) (Two Packet System).

ESTIMATED COST (Tender Value) = Rs. 80,73,65,056.00

TO
THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED
27,RAJENDRA NATH MUKHERJEE ROAD, KOLKATA-700001.

1. I/We have read the various conditions to tender attached hereto and hereby agree to abide by the said conditions. I/We also agree the validity of this tender for a period of 120 days from the date fixed for opening the same and in default thereof. I/We will be liable for forfeiture of my/our "Earnest Money". I/We offer to do the work at the rates quoted in the attached Schedules and hereby bind myself/ourselves to complete the work in all respects within 20 (**Twenty**) months from the date of issue of Letter of Intent (LoI) or Work Order, whichever is earlier.
2. I/We also hereby agree to abide by the (i) Railway General Conditions of Contracts and Standard Special Conditions of Contracts, 1998; (ii) **Unified Standard Specification works & materials 2010**; (iii) Special Conditions and Specifications attached with the tender; and (iv) United Schedule of Rates (for Works and Materials) of Railway, 2010 edition corrected up to date.
3. A sum of **Rs 20,000,00.00** is hereby forwarded as earnest money. The full value of the earnest money shall stand forfeited without prejudice to any other rights or remedies, if:
(a) I/We do not execute the contract documents, within 7 (seven) days after receipt of notice issued by BBJ that such documents are ready, or (b) I/We do not commence the work within 10 (Ten) days after receipt of the orders to this effect or (c) I/We withdraw or modify my/our offer within the validity date of the tender or (d) non submission of Bank Guarantee within due date as instructed by BBJ.
4. Once the acceptance of the tender is communicated to us a legal and enforceable contract comes in to being. If in accordance with the letter of the acceptance I/We fail to commence work within the period stipulated in the acceptance letter and fail to execute the formal agreement, I/We shall be liable for breach of the contract and the consequences of breach of any of the conditions of the contract shall entitle BBJ Administration to have work/job executed at my/our risk and cost and to claim extra cost/expenditure sustained by the BBJ Administration.

Signature of Witnesses.

1. _____, Address:
2. _____, Address:

SECTION - III

Salient Features

&

Nature of Work

SALIENT FEATURES:

NAME OF THE WORK: FABRICATION, SUPPLY, ERECTION AND COMPLETING OF SUPERSTRUCTURE FOR BRIDGE NO.2 & 3 (IN SUMBER STATION YARD) AND BRIDGE NO. 61 (OVER TATSUN NALLAH) ON KATRA-QAZIGUND SECTION OF UDHAMPUR-SRINAGAR-BARAMULLA NEW BG RAILWAY LINE PROJECT. (PACKAGE: BRIDGE- 2, 3 & 61).

THE SALIENT FEATURES OF THE PROPOSED CONSTRUCTION OF Fabrication, supply, erection and completing superstructure for Bridge no.2, 3 & 61 etc.

2.0 Location : a) Bridge No. 2 & 3 in Sumber station yard;
: b) Bridge no. 61 over Tatsun Nalla;

2. **Detailed for construction work:** Fabrication, supply, erection and completing superstructure of Composite girder for Bridge no. 2 (11 X 39m), Bridge no. 3 (8X39m) span & Bridge no. 61 (2 X 30.5m + 1 X 24.4m) span etc.

NATURE OF WORK:

Name of work: Fabrication, Supply, Erection and Completing of Superstructure for Bridge no. 2 & 3 (In Sumber station yard) and Bridge No. 61 (Over Tatsun Nallah) on Katra-Qazigundsectionof Udhampur-Srinagar-Baramulla New BG Railway line Project. (Package: Bridge- 2, 3 & 61) (Two Packet System).

1.0 SCHEDULE - A (For Bridge No.2)

USSOR/NFR/DSR/NP Items i.e. Supply, fabrication, assembling, blasting, metallising and painting erection / launching, completion incl. alignment, fixing girders in position (line & level), Supply and fixing of bearing, Deck slab, wearing course, concrete cross beam, Pre cast element edge beam, Pre cast for cable duct, logitudinal movement joint and strip seal expansion joint etc. for complete span.

2.0 SCHEDULE - B: (For Bridge No.3)

Supply, fabrication, assembling, blasting, metallising and painting erection/launching, completion incl. alignment, fixing girders in position (line & level), Supply and fixing of bearing, Deck slab, wearing course, concrete cross beam, Pre cast element edge beam, Pre cast for cable duct, logitudinal movement joint and strip seal expansion joint etc. for complete span.

3.0 SCHEDULE - C: (For Bridge No.61)

Supply, fabrication, assembling, blasting, metallising and painting erection/launching, completion incl. alignment, fixing girders in position (line & level), Supply and fixing of bearing, Deck slab, wearing course, strip seal expansion joint etc. for complete span.

4.0 The contract envisages all permanent and temporary works which are necessary for the efficient execution and completion of works.

5.0 The information and data stated herein and to be incorporated in contracts elsewhere is for the general guidance only and is subject to vary with more detailed site investigation.

CHECK LIST TO BE SUBMITTED BY THE TENDERER:

DESCRIPTION	REMARKS (TO BE SUBMITTED)
Cost of tender of Rs 10,000/- as Demand Draft	
Earnest Money Deposit of Rs 20.00 Lac as Demand Draft	
Documentary evidence in support of eligibility criteria (Technical & financial criteria) as per Annexure A	
Copy of Pan Card, Good & Service Tax (GST) registrsation certificate, Copy of E.S.I. & P.F. Registration Certificate;	
Annual Report & Account for last 3 years ending as on 31.03.2017	
Format of Affidavit as per Annexure - B	
List of plant & machineries as per Table A	
List of technical Manpower as per Table B	
Company Profile as per Proforma - I of Annexure - C	
Details of Annual turnover for last last 3 years, details of similar works completed in last 7 years and statement of works abandoned / left incomplete as per Proforma - II, IIA & IIB of Annexure - C.	
Details for deployment of Plant and Machineries proposed to be engaged on the project as per Proforma - III of Annexure - C	
Details for deployment of Technical and other Key Personnel available on hand and proposed to be engaged in work as per Proforma - IV of Annexure - C	
Details of Court Cases during last seven years as per Proforma - V of Annexure - C	
Details of Arbitration if any (in last 7 years) as per Proforma - VI of Annexure - C	
Broad plan of execution of this work within stipulated completion period as per Proforma - VII of Annexure - C	
Certificate of Familiarization as per Proforma-VIII of Annexure - C	
Pre Contract Integrity Pack	
Form of Agreement, Certificate of Familiarisation, Undertaking by Tenderer, Key Dates of different activities for Completion of Superstructure of Bridge No. 2, 3 & 61 and Programme of Execution of Works in line with the Key Dates for the Contract as indicated in Special Condition of Contract	
covering letter	
power of attorney	
Signature & stamped at each page	
attestation of credentials	
Full communication address with mobile no of contact person	
Documents related to constitution of agency (whether proprietor, partnership, company etc.)	

SECTION - IV

INSTRUCTION TO TENDERER

REGULATIONS FOR THE GUIDANCE OF TENDERERS

1.0 The following documents shall form part of the contract: -

- (a) Tender form.
- (b) General Conditions of Contracts and Standard Special Conditions of Contracts, 1998, Indian Railway Unified Standard Specification Volume I & II and USSOR Schedule of Rates (for Labours and Materials) of Northern Railway, corrected up to date.
- (c) Special Conditions of Contract.
- (d) General Technical Specifications for the work.
- (e) General Conditions of Contracts
- (f) Agreement forms.
- (g) Schedule of Item rates & Quantities / Bill of Quantities of Works.
- (h) Drawings.
- (i) Indian Railway Engg. Code 1999 latest Revised Edition.

2. INSTRUCTIONS TO TENDERER(S)

2.1 REGISTRATION OF CONTRACTOR

Any contractor willing to take part in the process of e-Tendering will have to be enrolled & registered with the Government e-Procurement system, through logging on to <https://eprocure.gov.in/eprocure/app>.

2.2 DIGITAL SIGNATURE CERTIFICATE (DSC)

Each contractor is required to obtain a Class-II or Class-III Digital Signature Certificate (DSC) for submission of tenders, from the approved service provider of the National Information's Centre (NIC) on payment of requisite amount details are available at the website stated in Clause 2 of Guideline to bidder DSC is given as a USB e-Token.

2.3 SUBMISSION OF BID:

Bid is to be submitted online through e-Procurement system of CPPP. Only END & Cost of tender of requisite amount have to be submitted into BBJ's Head office before the opening date of tender. **Tender document is to be digitally signed by the bidders.** The rates in the appropriate space in the Schedule of Rate/Bill of Quantity should be properly filled in.

- I. Each and every page of the downloaded tender documents is to be **digitally signed** by the tenderers under seal of the participating firm/tenderer before submission.
- II. Incomplete tenders are liable to be rejected without further correspondence.
- III. Earnest Money & cost of tender shall be deposited by the tenderers only. Tender not accompanied by the requisite Earnest Money & cost of tender shall be summarily rejected.
- IV. The drawings for the works can be seen in the BBJ office at 27, R. N. Mukherjee Road, Kolkata-700001 during office hour from 10.00 A.M. to 5.00 P.M. (lunch break 1.00 P.M. to 2.00 P.M.) on any working days (Monday to Saturday, except 2nd & 4th Saturday as Holiday).
- V. General Conditions of Contract, Standard Special Conditions of Contract, 1998 and Indian Railway Unified Standard Specification Volume I & II 2010 edition and USSOR Schedule of Rates (for Labours and Materials) of Northern Railway, latest edition corrected up to date should follow.
- VI. Properly filled up Sshedule of Rate/Bill of Quantity (BOQ) is to be uploaded in CPP's website (<https://eprocure.gov.in/eprocure/app>). Price bid of only those bidders will be opened whose Techno-commercial offers are found to be qualified and acceptable to BBJ. BBJ has no responsibility for the accuracy. BBJ does not guarantee work under the items of the schedule.
- VII. All documents and entries in the tender shall be either type written or in ink and should be in English. Tender containing erasures, additions and alterations to the tender documents are liable to be rejected. Any correction made by the Tenderer(s) in his entries must be attested by him. If rates expressed in figures and words do not agree, then the lower of the two rates will be taken into consideration and binding on the contractor.

Section - IV

- VIII. BBJ will disqualify tenderer(s), if they have made misleading or false representation in the form, statements and attachments submitted or indulge in fraudulent and corrupt practice.
- a) "Corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the tendering process or in contract execution;
 - b) "Fraudulent practice" means a misrepresentation of facts in order to influence and evaluation process or the execution of a contract, and includes collusive practices among Tenderers (prior to or after Tender submission) designed to establish bid prices at artificial, non-competitive levels and to deprive the client's free and open competitions.
- IX. Further BBJ may declare a Tenderer ineligible, for any BBJ contract if it at any time determines that the Tenderer has engaged in corrupt or fraudulent practices in completing for, or in executing, a borrowed financed contract in general; or defines, for the purpose of this provision, the terms set forth below as follows:
- a) Records of poor performance during the last 5 years, as on the date of submission of tender such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor.
 - b) Inordinate delays in completion, consistent history of litigation awarded against the tenderer/contractor or any of its constituents or financial failure due to bankruptcy, etc. If the Contractor has worked in a Joint Venture, the rescinding of contract of a Joint Venture on account of reasons other than non-performance, such as Most Experienced Partner (Lead Partner) of Joint Venture pulling out.
- Or**
- c) Been debarred (blacklisted) by any Government agencies as on the date of application.
- X. **The Techno Commercial Part should contain the following documents, which to be submitted/upload with the offer:**
- a) Tender Document Fee amounting to **Rs. 10,000.00/-** (Rupees Ten thousand only) in the form of Demand Draft drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata. Scanned copy to be uploaded in CPP's portal and instrument to be submitted physically along with other documents.
 - b) EMD amounting to **Rs. 20,000,00.00/-** (Rupees twenty lakhs only) in the form of Demand Draft drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited", payable at Kolkata. Scanned copy to be uploaded in CPP's portal and instrument to be submitted physically along with other documents.
 - c) Copy of Good & Service Tax Registration Certificate;
 - d) Copy of Pan Card;
 - e) Copy of Employees State Insurance (ESI) Registration;
 - f) Copy of Provident Fund Registration Certificate;
 - g) Digitally signed copy of tender documents with drawing, technical specification;
 - h) **Copy of relevant documents relating to experience certificate / job completion certificate, Work Orders received from clients etc. proving past experience as per Technical eligibility criteria stated at page (6).**
 - i) Audited Annual Report consisting of Balance Sheet & Profit & Loss Statement for last 03 (three) financial years ending as on 31.03.2017 in support of Financial eligibility criteria **stated at page (6).**
 - j) All Annexures, forms, proformas, Tables etc., as stated in this tender document, duly fill-in-format with signed & official stamped.

I/We, M/s _____ declare that

- (a) We have examined and have no reservations to the Tender Documents, including Addenda issued.
- (b) We offer to execute the Works in conformity with the Tender Documents & drawings;
- (c) If our tender is accepted, we commit to submit Security Deposit and Performance Guarantee in accordance with the tender Document within the time fixed;
- (d) If our tender is accepted, we commit to deploy required key personnel and equipments consistent with the stipulation in the Tender Document.
- (e) If our Tender is accepted, we commit to submit work method statements for all major activities and get these approved from the engineer prior to commencing work on such activities. We also understand that the work shall be executed as per the approved method statements without any deviations;
- (f) If our tender is accepted, we commit to establish Testing Laboratory at the site of work with minimum Testing equipments indicated in the Tender Document.
- (g) I/We am/are not banned from doing business with Railways or any other Ministry/ Department of the Govt. of India / State Govt. from participation in tenders / contract on the date of opening of bids either in individual capacity or the JV firm or partnership firm in which we were/are members/partners.
- (h) I/We are not sister concerns/allied partners who were individuals or firms or partners of firms banned from doing business with Railways.
- (i) I/We understand and agree that if I/We were found during consideration of the tender to be a firm/individual or sister/allied concern or any individual or firms or partner of firms banned by the Ministry of Railway or any other Ministry/ Govt. Department from doing business and ban is still in force, Earnest money deposit remitted by me/us will be forfeited in full.
- (j) I/We understand that if I/We were found during the course of execution of work to be an individual or firm or partner or firms or sister/allied concern of any individuals or firms banned by the Ministry of Railway or any other Ministry/ Govt. Department from doing business and the ban is still in force, my/our security deposit and Performance Guarantee will be forfeited in full.
- (k) I/We understand that if I/We are found to be individual or firm or partner of firm or sister/allied concern of any individuals or firms banned by the Ministry of Railways or any other Ministry/ Govt. Department from doing business during the consideration of tender or during the execution of work, I/We are liable to be banned from doing business for further periods to be specified by Railways.
- (l) I/We are satisfying the eligibility conditions mentioned in the tender and I/We have enclosed attested copies of documents along with the tender in support of my/our claim of satisfying eligibility conditions. I/We understand that I/We have to produce the original documents if so demanded by the BBJ. I/We understand that if any of the documents were found to be bogus, my/our earnest money deposit (before finalisation of tender) security deposit (after awarding work) will be forfeited in full and I/We are liable to be banned from doing business with BBJ for any period to be specified by the BBJ and also liable for legal proceedings against me/us.
- (m) I/We have submitted full details of work on hand and progress thereon. I/We understand that if the information furnished by me/us were found to be false my/our tender is liable to be rejected and Earnest money deposit in full is liable to be forfeited. If it is found to be false at any stage, I/We are liable to be banned from doing business with BBJ for any period to be specified by BBJ and also liable for legal proceedings against me/us.

- (n) We have not made any tempering or changes in the Bidding Documents on which the Bid is being submitted and if any tampering or changes are detected at any stage, we understand that the Bid will summarily rejected and forfeiture of Bid Security / the contract will be liable to be terminated along with forfeiture of full amount of performance security, even if LOA has been issued; and
- (o) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.
- (p) I/we are not sister concerns/allied partners of firm's, who have been found guilty in any criminal case in the past.

Name

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

SIGNATURE & ADDRESS OF WITNESSES TO THE SIGNATURE OF THE TENDERER(S)

WITNESSES :

1. Name :	Signature:
Address :	Date :

2. Name :	Signature
Address :	Date :

4.0 SIGNING OF TENDERS:

- 4.1 The tenderer/Contractor shall digitally sign each and every page of the Tender document.
- 4.2 Any individual/s signing the Tender or other documents connected therewith should specify whether he is signing:
- (i) As Sole Proprietor of the concern or his Attorney, or
 - (ii) As a Partner or Partners of the Firm, or
 - (iii) For the Firm per procuration, or
 - (iv) As a Director, Manager or Secretary in the case of Limited Company.
- 4.3 In the case of firms not registered under the Indian Partnership Act all the partners, or the attorney duly authorised by all of them should sign the tender and all other connected documents. The original document empowering the individual or individuals to sign, the original partnership deed with registration certificates, if any, in case the tenderer(s) is a firm and the Memorandum and Articles of Association in case the tenderer(s) is a Company should be furnished to the purchaser for verification if required.

EARNEST MONEY

- 5.0
- 5.1 **A tender not accompanied with requisite Earnest Money will be summarily rejected.**
- 5.2 Earnest money shall not be acceptable in the shape of Bank Guarantee Bond.
- 5.3 If instruments are found to have been drawn in favour of/payable to the tenderer, they would be invalid and the tender submitted would be summarily rejected.
- 5.4 The name of the tenderer (party), on whose account the Demand Draft has been issued, is to be mentioned by the Banker or bidder, at an appropriate place on the instrument or backside of the instrument.
- 5.5 Government securities (Stock Certificates, Bearer Bonds, Promissory Notes etc.) and Guarantee bonds executed by banks will not be accepted towards earnest money.
- 5.7 In the event of tenderer(s) defaulting by not adhering to the conditions laid down in para 4.0 & other condition laid down in the tender document, the BBJ Administration shall be entitled to forfeit the full amount of earnest money deposited along the tender without prejudice to any other remedy available to the BBJ.
- 5.8 No interest will be paid on earnest money. The earnest money will be refunded to the unsuccessful tenderer(s) after finalization of Work Order within a reasonable period of time. The earnest money deposited by the successful tenderer(s) will be retained towards the security deposit for the due and faithful fulfillment of the contract but shall be forfeited if the contractor fails to execute the agreement or start the work within time schedule determined by the Engineer after notification of the acceptance of his/their tender.
- 5.9 BBJ shall be entitled to forfeit the earnest money specified for the particular work if the tenderer(s) fails/fail to execute the agreement or start the work within Schedule time.

6.0 CREDENTIALS

- 6.1 The tenderer(s) is/are required to submit along with his/their tender, authenticated documents and certified details in support of their credentials and proof of their capacity to be able to undertake this work as per **Annexure - A** duly signed by the tenderer(s) himself/themselves also. It may please be understood that in the event of furnishing incomplete information or no information at all, Railway reserves the right to reject the offer outright, without making any reference to the tenderer(s).
- 6.2 Non-compliance with any conditions mentioned above is liable to result in the tender being rejected.

7.0 ACCEPTANCE OF TENDER

- 7.1 The authority for the acceptance of the tender rest with the Chairman & Managing Director of BBJ who does not bind himself to accept the lowest or any other tender nor does he undertake to assign reasons for declining to consider any particular tender or tenders. No tenderer(s) shall demand any explanation on the cause of rejection of his/their tender. No correspondence will be entertained with the tenderer(s) in respect of the rejection of any or all tenders.

- 7.2 Tender documents submitted by the tenderer(s) shall become the property of BBJ and the BBJ shall have no obligation to return the same. The cost of Tender Document is not refundable.
- 7.3 If the tenderer(s) deliberately gives wrong information in his tender the BBJ reserves the right to reject such tender at any stage.
- 7.4 If a tenderer(s) expires after the submission of his tender or after the acceptance of his tender, the BBJ shall deem such tender as cancelled. If a partner of tendering firm expires after the submission of or after acceptance of their tender the BBJ shall consider such tender as cancelled unless the firm retains its character.
- 7.5 The accepting authority reserves the right to divide the tender amongst more than one tenderers, if deemed necessary, and also to reject any or all tenders received without assigning any reason and does not bind himself to accept the lowest or any other tender. In case of splitting of scope of work, L1 bidder will get atleast 60% of total work.
- 8.0 **EXECUTION OF CONTRACT DOCUMENT:**
- 8.1 The tenderer whose tender is accepted shall be required to appear in the Head Office of BBJ in person, or if a firm or corporation, a duly authorized representative shall so appear, to execute the contract documents within seven days after notice to do so. Failure to comply shall constitute a breach of the agreement effected 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.
- 8.2 In the event of any tenderer, whose tender is accepted refusing to execute the contract documents as therein before provided, the BBJ may determine that such tenderer has abandoned the contract and thereupon his tender and the acceptance thereof shall be treated as cancelled & the BBJ shall be entitled to forfeit the full amount of the earnest money and to recover the liquidated damages for such default equivalent to the amount of Performance Gaurantee.
- 8.3 The tenderer shall keep the offer open for a minimum period of 120 days from the date of opening of the tender within which period the tenderer cannot withdraw his offer. This period may be extended further if so required by mutual agreement between the parties from time to time. Any contravention of this condition will make the tenderer liable for forfeiture of this security deposit.
- 8.4 The tenderer/s shall clearly specify whether the tender is submitted on his behalf or on behalf of partnership concern. If the tender is submitted on behalf of partnership concern, he should submit the certified copy of partnership deed along with the tender and power of attorney to sign the tender documents on behalf of partnership concern. If these documents are not enclosed along with the tender documents, the tender will be treated as having been submitted by the person signing the tender in his individual capacity.
- 9.0 BBJ will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. It may, however, recognize such power of attorney and changes after obtaining proper legal advice the cost of which will be chargeable to the contractor.
- 10.0 If the tenderer, whether a sole proprietor, limited company or a partnership firm wants to act through agents or individual partner/partners, should submit along with the tender or at a later stage a power of Attorney duly stamped and authenticated by a public notary or by a Magistrate in favour of the specific person/s whether he/they be partner/s of the firm or any other persons, specially authorizing him/them to submit the tender, sign the agreement, receive money, witness measurement, signs measurement book, compromise, delete relinquish any claim or claims preferred by firm and sign "No claim certificate" and refer all or disputed items to arbitration.
- 11.0 BBJ reserves the right to accept a tender in whole or in part or reject any tender or all tenders without assigning reasons for any such action.

12.0 NEGOTIATIONS WITH TENDERER(S)

BBJ reserve the right to hold negotiations with lowest bidder who should be lowest, valid, eligible and technically acceptable tenderer considered for award of contract directly, if the rates were not unreasonably high.

13.0 INSPECTION TO SITE

Before submitting a tender, the tenderer/s 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 and that the rates he has entered in "Schedule of Rates / Bill of Quantity" of the tender document are adequate and all inclusive to accord with the provision of the general and special conditions of contract for the completion of the works to the entire satisfaction of the Engineer. No claim shall be entertained from the contractor for making his own arrangements for approached roads from outside Railway land and contractor will bear entire expenses such as road taxes, payment on right of way etc. to outsiders.

14.0 Examination of Documents

The submission of the tender shall be deemed to have been done after careful study and examination of the tender document with full understanding of the implications thereof. Any clarification required by a tenderer shall be obtained from the office inviting tenders on any working day.

15.0 Tender documents are not transferable and cost of tender document is not refundable.

16.0 Sequence of work:

16.1 The contractor(s) shall comply with the order of engineer in charge in regard to the sequences of tackling and progressing component parts of works.

16.2 The super-structure works for this bridge are planned after a few months from start of subject foundation and sub-structure works. Accordingly, the contractor will be working in due course on both sides of approach of the bridge. The agency is therefore required to adhere to work in a co-ordinated manner. The Engineer-in-charge decision will be final and binding in case of dispute arise.

17.0 PROGRAMME OF WORKS

17.1 The successful tenderer within **20 days** after the contract is awarded, will make out a detailed Bar Chart along with detailed **programme chart** for each sub-activity based on accepted scheme indicating various stages of execution, method of execution and completion of work in different stages keeping the period of completion in view and submit the same to the engineer for the consideration and approval. The above programme shall be strictly adhered to.

18.0 Deployment of Key Plant & Equipment

18.1 The successful tenderer shall have to deploy key plant & equipment not less than the scale of deployment for the same as specified at Table-A duly adhering to the schedule of deployment. The successful tenderer shall deploy additional machinery as considered necessary for the timely completion of work as per site conditions.

19.0 Deployment of Key Personnel:

19.1 The successful tenderer shall have to deploy key personnel not less than the scale of deployment for the same as specified at Table-B. The successful tenderer shall deploy additional experienced personnel & skilled/semi-skilled labour for the timely completion of work as per site condition.

SECTION-V

Forms, Annexures, Proforma,
Tools, Plants & Key Personnel etc.

ANNEXURE - A

(A) EXPERIENCE :

- (i) No. of years the firm has been in operation under its present name.
- (ii) Details of work executed/being executed by the tenderer in the last Seven (7) years.
- (iii) Testimonials from Clients Company on various works executed /being executed for the last Seven (7) years (with documentary proof).

(Details of works executed/under execution in the last Seven (7) years)

Sl. No.	Name of work & Work Order number (executed / being executing)	Clients Address & Contract No.	Contract Value / Estimated value	Specified date of completion	Present status (completed on / to be completed on, Penalty imposed or to be imposed etc.)
(1)					
(2)					

(B) Financial Position :

- (i) Financial Turnover during the last three years (Copies of Audited Annual report, P/L Accounts or a statement duly certified by a chartered accountants should be enclosed)

FINANCIAL YEAR	Turnover (Rs. in lakhs)
2014 - 15	
2015 - 16	
2016 - 17	

(C) Technical Capability:

- (i) List of tools, Plants, equipment and machinery available with the tenderer along with their value (A copy approved Assessor's Certificate to be enclosed).
 - (ii) Name, qualifications of the technical Supervisors and staff under the employment of the tenderer and organization on hand and proposed to be engaged for the subject work (Authenticated by a chartered Accountant).
 - (iii) Other facilities available with the tenderer not covered hither to:
- (D)** Tenderer(s) knowledge from actual personal investigation of the resources of the region or District(s) in which he offers to work:
- (E)** Any other details that the tenderer may like to furnish to substantiate their financial and technical ability to undertake this work and complete the same within stipulated period of completion.

Table-A

A. LIST OF PLANT AND MACHINERY TO BE DEPLOYED AT SITE:

A list of Plant & Machinery required for completion of the work within the time frame is given hereunder. Bidders are free to evaluate and work out the additional requirement at their own.

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

Note: Contractor may obtain required grade of ready mix concrete from nearby approved batching plant and transport the same with adequate numbers and quantity of transit mixer.

Table-B

B. Deployment of Key Personnel at Site

A list of Minimum Key Personnel / Engineer having major bridge construction in hilly region experience required for completion of the work within the time frame is given hereunder. Bidders are free to evaluate and work out the additional requirement at their own. Further Contractor has to engage local manpower / resources ranging from 5 to 10% to help local participation and skill development depending upon availability of resources and nature of work.

Sl. No.	Post & Minium Eligibility	Minium Require-ments in Nos
1	Project Manager, Graduate in Civil Engineering with 12 or more years' experience in Bridge construction in hilly region.	1 (one)
2	Construction Manager, Graduate in Civil Engineering with 8 or more years' experience in Bridge construction in hilly region.	1 (one) for contract, subject to at least 1 (one) at each bridge site during field work
3	Fabrication Manager, Graduate in Civil Engineering with 8 or more years' experience in Fabrication of Steel Works.	1 (one) for each fabrication workshop
4	Site Engineer, Diploma in Civil Engineering with 5 or more years' experience in Bridge Girder fabrication/construction	2 (two) for each bridge site during field work
5	Quality Engineer, Graduate in Civil Engineering with 5 or more years' experience in Bridge Girder fabrication/ construction	1 (one) for each fabrication workshop & 1 (one) for each bridge field work
6	Survey Engineer - Diploma in Civil Engineering with 5 or more year's in Bridge Construction	2 (Two)

C. EMPLOYMENT OF QUALIFIED ENGINEERS

- i. The Contractor shall employ sufficient number of technical staff who shall be qualified Graduate Engineers and Diploma holders as required for setting out alignment, taking the established bench marks and the cross section levels plotting the cross section levels, computation of quantities, taking measurements, preparation of bills and also for efficient supervision of various works at different work spots. The list of names, qualification and experience of these personnel should be furnished along with the tender documents as per format given to this Tenderers document. The Contractor should also submit a list of names of graduate Engineers and diploma holders with their bio-data to BBJ within 15 days from the date of issue of Letter of Acceptance for approval by the Engineer. Any further changes should be advised and got approved and enforced without any extra cost.
- ii. The Contractor's technical staff should be available at site to take instructions from the Engineer of BBJ. In case the Contractor fails to employ sufficient number of qualified technical staff, BBJ reserves its right to take necessary action under provisions of the General Conditions of Contract. Relevant costs at charge of contractor.

D. Deduction of Payment on account of Non-deployment of Key Personnels:

- i. The Key personnel will be those for which the CV's have been approved by Engineer-in-charge.
- ii. The effective date of recovery will be 28 days of issue of Letter of Acceptance.
- iii. Absence for more than 15 days in a month will be considered as equivalent to non-deployment of manpower.
- iv. This deduction will be independent from the other deductions applicable as per contract.
- v. The maximum limit of deduction on account of non-deployment of Key Personnels will be 1% of Original Contract Value.
- vi. The certification of Engineer-in-charge for non-deployment of Key personnel will be sufficient ground for effecting deduction from each on account bill.

The rate of recovery per month for non-deployment of Key personal will be as under:

Position	Unit	Nos	Deduction per month in case of Non deployment of Key Personnel
Project Mananger	No.	1	Rs. 1,50,000.00
Construction Manager	No.	1	Rs. 1,00,000.00
Fabrication Manager	No.	1	Rs. 1,00,000.00
Site Engineer	No.	1	Rs. 50,000.00
Quality Engineer	No.	1	Rs. 50,000.00
Survey Engineer	No.	1	Rs. 50,000.00

However, sub-contractor fails to deploy required no. of manpower at project sites for the reasons not attributable to the sub-contractor, BBJ may, if satisfied, allow the sub-contractor to complete the work, without imposing any deduction.

E. Contractor Performance Feedback and Evaluation System

The employer will have a 'Contractor Performance Feedback and Evaluation System' for periodic evaluation of Contractors performance during execution of Contract. In case contractor's over-all performance is found unsatisfactory (<85% for Works Contracts and <75% for Consultancy Contracts) based on the parameters as listed below, the Contractor is liable to be declared a 'Non-Performer', and will become ineligible for participation in future tenders of this Organization for a period of 2 (two) years from the date of such decision. This decision is to be conveyed to the Contractor in writing. The non-performance status may be revoked during currency of the contract on improvement of performance parameters during the next annual review.

This is without prejudice to any other recourse available to the Employer under the Condition of Contract.

Table - C

ASSESSMENT OF PERFORMANCE

Sl. no.	Description	Weightage		Remarks
		Assigned	Obtained	
1	Resource Management / Financial Status			
1.1	Timely mobilization of manpower, as per the requirement of work and/or as suggested by Engineer in writing	5		
1.2	Timely mobilization of machinery, as per the requirement of work and/or as suggested by Engineer in writing	5		
2	Physical Progress /Project Execution Capability	75		
2.1	Target vs Achieved review of the progress and adherence to milestones of the work as per above submitted & approved programme (may be judged as below, to be modified depending on availability of front/site or as indicated in Contract)			
a	At 33% time: >15%			
b	At 50% time : >30%			
c	At 100% time: >60%			
d	At 175% time: >98%			
3.	Quality Assurance Capability			
3.1	Documentation of procedures, work instructions, check list and adherence to the requirements of ISO 9001:2008	4		
3.2	Rectification of defects / non conformity to quality standards within writing/Rectified within 30 days of writing)	4		
3.3	Implementation of corrective and preventive measures to control non-conformities / rejections	2		
4.	Claims and Disputes			
4.1	Raising unnecessary claims and litigation	5		
	TOTAL	100		

ANNEXURE - B

FORMAT OF AFFIDAVIT

I/we, the undersigned, do hereby solemnly affirm and declare that-

1. Neither our firm nor any of the members / partners in any manner as an individual or the constituent partner in case of partnership firm have been declared non-performer by any Organization / Authority / Public Sector Enterprises in India, any Govt. Department in India or a multilaterally funded agency during the last 2 years prior to the date of our bid submission.
2. As on date of bid submission, neither our firm nor any of the members/partners in any manner as an individual or the constituent partner in case of partnership firm are debarred for tendering, blacklisted, suspended in any organization / Authority / Public Sector Enterprises in India, any Govt. Department in India or a multilaterally funded agency.
3. We have no objection to BBJ requesting to any bank, person, firm or body and any such agency furnishing pertinent information as deemed necessary or to verify this statement or regarding our competence and general reputation.
4. We understand that further qualifying information may be requested by BBJ and we agree to furnish any such information at the request of BBJ within the prescribed time.
5. We bind ourselves with all the stipulations of the Bidding Document including period of completion, provision of adequate equipment, personnel and other resources required for completion within the stipulated completion period and agree to augment any resources, if found necessary for timely completion of the project, as desired by the BBJ.
6. We have read and understood all the provisions included in the Integrity Pact and abide by them, if applicable.
7. **We have read and understood all the provisions included in the bid documents and abide by them.**
8. The information furnished by us is correct and we understand the consequences in case any of the information furnished is not found to be true.

(Signed by the Authorized Representative of the Firm)

Name of the Authorized Representative:

Name of the Firm:

Dated:

ANNEXURE - C

Special Conditions

Following document are required to be submitted along with the tender by the tenderer(s) for consideration of BBJ.

Documents to be submitted with the Tender

SI. No.	Particulars	Document Format	Please specify by the bidder whether submitted or not
1	Company Profile	Proforma – I	
2	Details of Annual turnover for last the last three years, details of similar works completed in last seven years and statement of works abandoned/left incomplete.	Proforma – II , IIA & IIB	
3	Details for deployment of Plant and Machineris proposed to be engaged on the project.	Proforma – III	
4	Details for deployment of Technical and other Key Personnel available on hand and proposed to be engaged in work.	Proforma – IV	
5	Details of Court Cases during last seven years.	Proforma – V	
6	Details of Arbitration if any (in last 7 years)	Proforma – VI	
7	Broad plan of execution of this work within stipulated completion period.	Proforma – VII	
8	Certificate of Familiarization	Proforma -VIII	

PROFORMA - I

COMPANY PROFILE:

Sl. No.	Particulars	Details
1	Full name of the contractor / construction firm and year of establishment	
2	Registered & Head Office Address along with Telephone no / fax no / e-mail:	
3	Branch Office in India Address with Telephone no / fax no / e-mail:	
4	Constitution of firm: (Copy of full details including Memorandum of Association and Articles of Association, registered Partnership Deed and Power of Attorney holder etc.to be enclosed)	
5	Particulars of registration with Government / semi Government Organisation (copy to be enclosed)	

PROFORMA-II

ANNUAL TURNOVER FOR THE LAST THREE (3) YEARS

Sl. No	Financial Year	Turnover from Civil Engineering Works (In lac of Rs.)	Turnover from all sources (In lac of Rs.)	Remarks
1	2	3	4	5
1	2014-2015			
2	2015-2016			
3	2016-2017			

Note:

1. Certified copy of Chartered Accountant (sign with his registration No.) showing Turnover of tenderer showing Turnover from Civil Engineering Works & Turnover from all sources.
2. Please attach certified / attested copies of the latest Annual Account and/or Profit and Loss Account Statement to support the information furnished.

PROFORMA - IIA

DETAILS OF SIMILAR WORKS COMPLETED IN LAST SEVEN (7) YEARS ENDING AS ON 31.03.2017

Sl. No.	Description of Work	Name and address of the Employer	Contract No. & Date	Date of award of work	Stipulated date of completion	Date of actual completion	Value of completed work	Reasons for delays, if any	Penalty, if any imposed for delay	Any other relevant information	Remarks
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)

Note:

1. If any one or more of the detailed information furnished in the tenderers documents is provided to be false at any stage, the contractor /firm will be debarred then and there, from all the commitments connected with the tender and his /their tender /contract will be rejected /terminated and further action will be taken as per extant rules.
2. Separate sheet may be used for furnishing the above information, if necessary.
3. Please attach copies of the certificates issued by the Client.
4. Only those works shall be considered for evaluation for which copies of the certificates issued by the client are attached.

PROFORMA-IIB

STATEMENT OF WORKS ABANDONED / LEFT INCOMPLETE

Tenderer(s) should furnish the information as per proforma given below for last five (5) years ending 31.03.2017.

Sl. No.	Name of the work	Date of award of work	Contract No. & date	Name & address of Client (incl. Tel./Fax No.)	Contract value (in Rs.) Original / Revised	Percentage of work executed	Month & year since abandoned	Reason for abandoning the work
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

Note:

- 1) If any one or more of the detailed information furnished in the tenderer's documents is proved to be false at any stage, the contractor/ firm will be debarred then and there, from all the commitments connected with the tender and his/their tender/contract will be rejected/ terminated and further action will be taken as per extant rules.
- 2) Separate sheet may be used for furnishing the above information, if necessary.

PROFORMA-III

PROGRAMME FOR DEPLOYMENT OF PLANT AND MACHINERIES PROPOSED TO BE ENGAGED ON THE PROJECT.

Sl. No.	Description	Make	Model & Year of manufacture	Capacity	Condition	Nos proposed to be deployed	Programme of Deployment	Remarks
1	2	3	4	5	6	7	8	9

Note:

- 1) The agency will preferably be required to deploy one more machine each of the above description as standby so as to ensure that minimum above mentioned scale of machines are working at all times.
- 2) Failure to deploy the above equipment as per mutually agreed programme shall attract penalty @ Rs.5000/- per day for each machines. However, sub-contractor fails to deploy required no. of plant & machineries at project sites for the reasons not attributable to the sub-contractor, BBJ may, if satisfied, allow the sub-contractor to complete the work, without imposing any deduction.
- 3) List of plant and machinery require to be deployed at site is given at Table A in Annexure A.

PROFORMA - IV

PROGRAMME FOR DEPLOYMENT OF MANPOWER

Sl. No.	Name	Qualification(s)	Designation	Total experience (In years)	Programme for Deployment
1	2	4	5	7	8

Note:

- 1) List of manpower require to be deployed at site is given at Table B in Annexure A
- 2) Failure to deploy required manpower is depicted at point no. Deduction of Payment on account of Non-deployment of Key Personnels.

PROFORMA-V

LIST OF COURT CASES DURING LAST 7 YEARS

Sl. No.	Name of work	Value of work	Name of Client Deptt.	Name of the Court	Date of institution of case	Relief sought from Court	Brief reason of dispute	Final/ Present position of the case
1	2	3	4	5	6	7	8	9

PROFORMA - VI

LIST OF ARBITRATION CASES DURING LAST 7 YEARS.

Sl. No.	Name of work	Value of work	Name of Client Deptt.	Amount and date of claim preferred	Claim of Deptt. if any	Brief reasons of disputes	Final/ Present position of the case
1	2	3	4	5	6	7	8

SECTION - VI

PRE CONTRACT INTEGRITY PACT

PRE CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on _____ day of the month of _____ 2017 between on one hand, **THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED**, 27, Rajendra Nath Mukherjee Road, Kolkata – 700 001 (hereinafter called the “BUYER”, which expression shall mean and include, unless the context otherwise requires, its successors in office and assigns) of the First Part and M/s _____ represented by Shri _____ (Designation) (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 BUYER proposes to procure/contract for **e-TENDER NO:eNIT/DGM (P-V)/Br.No.2,3&61/J&K/2149/3130/R1** and the BIDDER/Seller is willing to offer/has offered the same and

WHEREAS the BIDDER is a private company/public company/Government undertaking /partnership/registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a PSU performing its function on behalf of the President of India.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to :-

Enabling the BUYER to obtain the desired said stores/equipment/contract 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 the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER 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 BUYER

- 1.1 The BUYER undertakes that no official of the BUYER, connected directly or indirectly with the contract, 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 BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.
- 1.2 The BUYER will, during the pre-contract stage, treat all BIDDERS alike, and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.

- 1.3 All the officials of the BUYER 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 BIDDER to the BUYER with full and verifiable facts and the same is prima facie found to be correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

Commitments of the BIDDERS

3. The BIDDER 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 contract or in furtherance to secure it and in particular commit itself to the following :-
- 2.0 The BIDDER 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 BUYER, connected directly or indirectly with the bidding process, or to any person, organisation or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.
- 2.1 The BIDDER 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 BUYER or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government/the Company for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with the Govt./the Company.
- 3.3* BIDDERS shall disclose the name and address of agents and representatives and Indian BIDDERS shall disclose their foreign principals or associates.
- 3.4* BIDDERS 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 BIDDER further confirms and declares to the BUYER that the BIDDER is the original manufacturer/integrator/authorized government sponsored export entity of the defence stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, 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 BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

- 3.7 The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 3.8 The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 3.9 The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.
- 3.10 The BIDDER commits to refrain from giving any complaint directly or thorough any other manner without supporting it with full and verifiable facts.
- 3.11 The BIDDER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.
- 3.12 If the BIDDER or any employee of the BIDDER or any persons acting on behalf of the BIDDER, either directly or indirectly, is a relative of any of the officers of the BUYER, or alternatively, if any relative of an officer of the BUYER has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filing of tender.

The terms 'relative' for this purpose would be as defined in Section 6 of the Companies Act 1956 or any amended therto.

- 3.13 The BIDDER 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 BUYER.
- 3.14 All disclosures required under this pact shall be included as Annexure/appendices thereto as an integral part of this pact.**
- 3.15 If the bidder / sub-contractor is a partnership or a consortium, this pact will be signed by all partners or consortium members

4. **Previous Transgression**

- 4.1 The BIDDER 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 exclusion from the tender process.
- 4.2 The BIDDER agrees that if it makes incorrect statement on this subject, BIDDER 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 While submitting commercial bid, the BIDDER shall submit an amount of **Rs.20,00,000.00** as Earnest Money in form of Bank Draft in favour of **THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED**.

- 5.2 The Earnest Money/Security Deposit shall be valid upto a period of five years or the complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and the BUYER including warranty period, whichever is earlier.
- 5.3 In case of the successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions of Violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.
- 5.4 No interest shall be payable by the BUYER to the BIDDER on Earnest Money/Security Deposit for the period of its currency.

6. Sanctions for Violations

- 6.1 Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the BUYER 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 BIDDER. However, the proceedings with other BIDDER(s) would continue.
 - (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.
 - (iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.
 - (iv) To recover all sums already paid by the BUYER, and in case of an Indian BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank Of India, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract for any other stores, such outstanding payment could also be utilised to recover the aforesaid sum and interest.
 - (v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.
 - (vi) To cancel all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation/rescission and the buyer shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.
 - (vii) To debar the BIDDER from participating in future bidding processed of the Government of India/the Company for a minimum period of five years which may be further extended at the discretion of the BUYER.
 - (viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.
 - (ix) Where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with BIDDER, the same shall not be opened.

- (x) Forfeiture of Performance Bond & encashment of EMD in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.
- 6.2 The BUYER 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 BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) of an offence as defined in chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.
- 6.3 The decision of the BUYER to the effect that a breach of the provisions of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the Independent Monitor(s) appointed for the purposes of this Pact.
7. **Fall Clause**
- 7.1 The BIDDER 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/systems or sub systems was supplied by the BIDDER 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 BIDDER to the BUYER, if the contract has already been concluded.
8. **Independent Monitors**
- 8.1 The BUYER will appoint Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation 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 BUYER.
- 8.6 The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER. The BIDDER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER with confidentiality.
- 8.7 The BUYER 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 designated Authority of BUYER/Secretary in the Department/within 8 to 10 weeks from the date of reference or intimation to him by the BUYER/BIDDER and should the occasion arise, submit proposals for correcting problematic situations.

9. **Facilitation of Investigation**

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the Books of Account of the BIDDER and the BIDDER 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 BUYER.

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 contract to the satisfaction of both the BUYER and the BIDDER/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful this Integrity Pact shall expire after six months from the date of the signing of the contract.

12.2 Should one or several provisions of this Pact turn out to be invalid, the reminder 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 _____

BUYER

Name of the Officer:

Designation:

Seal

Witness

1. _____

2. _____

BIDDER

Name of the Officer:

Designation:

Seal

Witness

1. _____

2. _____

* Provisions of these clauses would need to be amended/deleted in line with the policy of the BUYER in regard to involvement of Indian agents of foreign suppliers.

CHAPTER - VII

Special Condition of Contract

1.0 SCOPE OF WORK AND SITE LOCATIONS

1.1 Fabrication, Supply, Erection and completing of Superstructure for Bridge no. 2 & 3 (In Sumber Station Yard) and Bridge no. 61 (over Tatsun Nallah) on Katra-Qazigund Section of Udhampur-Srinagar-Baramulla New BG Railway Line Project. (Package: Bridge- 2, 3 & 61)

1.2 Construction of composite deck superstructure of bridges no. 2 (11 x 39m Composite Girder) and Bridge No. 3 (8 x 39m Composite Girder) at the Sumber station yard site and Bridge no. 61 (2 x 30.5m + 1 x 24.4m Composite Girder) is situated over tutsun nallah at Ind as shown on the GAD drawings. This also includes:

- All ancillary works required for successful completion of the work.
- Mobilisation of sufficient plant and machinery and skilled manpower to complete the work within the completion period specified.

Note: The foundations and substructures (up to pier cap, see below) are not included in the scope of work of this tender. However, co-ordination with the Contractor of the substructures is an essential requirement.

1.3 The steel girders shall be installed by means of a launching girder, since access from below is not permitted due to the steep terrain.

1.4 The Contractor shall submit a detailed design of the pier heads / pier caps in view of the required supports for the launching girder.

1.5 Any temporary access road to the areas below the bridge alignment including slope support and re-cultivation after construction shall be at the cost of the Contractor

1.6 The tenderer/s are advised to visit the site of works and ascertain himself/themselves with the proposed works, surroundings and working conditions, environment, prevailing law & order situation etc. The contractor shall carry out the work safely and no unsafe practices shall be followed. The tenderer are expected to take into account these factors while quoting the rates.

1.7 The work is to be done in a smooth coordinated manner without hindrance to the work of other agencies, local populace and surroundings and as per the instruction of Engineer in-charge

1.8 No claim for any stoppage of work by local populace for issues related to compensation, employment or any other shall be entertained.

1.9 The following working spaces will be shared by both the construction agencies of Tunnel as well as Bridge:

- o Between Abutment A1 of Bridge 2 and Portal P2 of Tunnel 48.
- o Between Abutment A2 of Bridge 2 and Sumber Yard Cut Works.
- o Between Abutment A1 of Bridge 3 and Sumber Yard Cut Works.
- o Between Abutment A2 of Bridge 3 and Portal P1 of Tunnel 49.
- o Between Abutment A1 of Bridge 61 and Portal P2 of Tunnel 14.
- o Between Abutment A2 of Bridge 61 and Portal P1 of Tunnel 15.

The work should be executed in coordinated manner and no claim on this account will

be entertained. In any case, the Tenderer shall familiarize himself with the available working environment at the remote area of Sumber and Ind village.

2.0 MOBILISATION ADVANCE:

2.1 Condition for Payment:

If requested by the Contractor in writing, the Employer/Engineer shall make an interest bearing mobilization advance payment to the Contractor for an amount not more than 10% (Ten percent) of the original contract value. The Mobilization advance shall be interest bearing at the rate of 4.5% per annum above the Base rate of State Bank of India, as effective on the date of approval of payment of Mobilization Advance by the Competent Authority. Interest will be compounded annually on reducing balance. Payment of such advance shall be made after fulfillment of the following conditions to the satisfaction of the Engineer:-

- i. Execution of the Agreement between the Engineer and the Contractor.
- ii. Submission of Performance Security by the contractor in accordance with Clause No.17 of Additional Special Conditions of Contract.
- iii. Submission of an unconditional bank guarantee (format to be provided later) from a Nationalized Bank or schedule Bank in India for an amount equal to 110% of the Mobilization Advance being paid and amount of interest for one year. The Bank guarantee may be split into four separate Bank Guarantees & each having a minimum value of 2.5% of the original contract value. Such Bank Guarantee shall remain effective until the advance payment along with the interest has been recovered from the Contractor. Bank guarantee(s) for the amount recovered from the Contractor shall be released to the Contractor progressively.

2.2 Payment:

After fulfillment of the pre-conditions as described in para 2.1 above, the mobilization advance shall be released to the Contractor in following stages:

Stage-I - Maximum 5% of contract value on fulfillment of the conditions described in clause 2.1 above.

Stage-II - Maximum 5% of contract value on establishment of site camps and offices, mobilization of necessary Plant and Machinery and man power and other facilities for commencement of work.

Satisfactory Utilization certificate from the contractor for stage-I mobilization advance should be obtained before releasing stage-II advance.

2.3 Recovery:

The recovery of mobilization advance along with up to date interest thereon shall commence from the Contractor's on account bills when the value of the work executed under the contract reaches 15% of the original contract value, and shall be completed when the value of work executed reaches 85% of the original contract value. The installments on each "on account bill" shall be on pro-rata basis.

In the event of amount of outstanding advance with interest thereon becoming more than the available B.G., the contractor shall have to provide a fresh B. G. with increased amount or provide a separate B. G. to cover additional amount likely to be overdue beyond the existing value of the Bank Guarantee.

2.4 CALCULATION OF INTEREST:

Interest shall be compounded on diminishing balance basis on the amount of advance outstanding. The date of issue of cheque shall be reckoned as the date on which the recovery has been made for purpose of computing the outstanding advance and working out the interest.

3.0 SUPPLY OF MATERIALS BY ENGINEER

- 3.1 Contractor shall make his own arrangements at his cost for all materials required

for execution, completion and maintenance of all items of work included in his scope of work to the complete satisfaction of the Engineer. Engineer shall not supply any materials nor shall assist for procurement of any materials required for execution, completion and maintenance of works.

3.2 PROCUREMENT OF MATERIALS

3.2.1 CEMENT

Cement for use in the works will be procured by the contractor from the reputed manufacturers/authorized dealers of **OPC-43/53** grade confirming to relevant IS Specification from the authorized dealers only. Cement shall be brought in bags, weight of each bag shall be deemed to be 50 Kg nominal.

The Contractor shall submit the proof of procurement of cement from the agency approved by the Engineer. The Contractor shall also submit the test certificates regarding the quality of the materials.

Cement older than 3 months from the date of manufacture as marked on the bags shall not be accepted.

3.2.2 STEEL FOR REINFORCEMENT

Generally Reinforcement steel (Fe500) shall be procured by the contractor at their own cost conforming to **IS: 1786** of following manufacturers:

**SAIL,
RINL,
TISCO**

The Contractor shall procure reinforcement steel from the approved manufacturers in accordance with the specifications of the contract. The Contractor shall submit the proof of procurement of reinforcement steel from one of the above agencies. The Contractor shall also submit the test certificates regarding the quality of the steel.

Binding wires used for binding the reinforcement shall be of approved quality soft annealed iron wire not less than 1 mm (18SWG) size, conforming to IS Specification.

3.2.3 STRUCTURAL STEEL

Structural steel shall be procured by the contractor from the following manufacturers:

**SAIL,
RINL,
TISCO**

The Contractor shall procure structural steel from any of the above manufacturers in accordance with the specifications of the contract. The Contractor shall submit the proof of procurement of structural steel from the above agencies. The Contractor shall also submit the manufacturer/external test certificates regarding the quality of the steel.

3.2.4 However as per guide lines of Railway Board Circular no. 2007/CE-I/CT/8 dated 1st May 2012, all Reinforcement Steel (TMT Bars) and Structural steel shall be procured as per specifications mentioned in BIS's documents IS: 1786 and IS: 2062 respectively. 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 materials and having in-house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's guidelines.

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. Traceability shall be ensured by an officer specially authorized by the Engineer-in-Charge on case to case basis for this purpose.

In all cases of such procurement prior approval is necessary from the Engineer-in-Charge.

The contractor has to arrange at his own cost cement & steel after taking approval from engineer-in-charge for samples he intends to use. The material must be conforming to the specifications and suitability of the site.

3.2.5 TEST CERTIFICATES:

The contractor shall submit the test certificates of Cement, Reinforcement Steel, Structural steel, Pre stressing steel, admixtures etc. The testing shall be done from Govt. approved laboratories/Institutions. BBJ reserves the right to get the above construction materials (even the stone aggregates, sand, water etc.) tested from any Govt. approved lab/Institutions, as and when required at Contractor's cost.

3.2.6 STORAGE AND CONSUMPTION OF MATERIALS AT SITE.

- a) The Engineer shall not be responsible for providing any storage accommodation for the materials arranged by the Contractor. In case of any materials being provided or arranged by the Engineer, the Contractor shall make his own arrangements for storage of same.
- b) Cement in bags shall be stacked by the contractor in godowns constructed by him with weatherproof roofs, suitable floors and walls as approved by the Engineer.
- c) Contractor shall construct suitable Godowns at site of work for storing other materials ensuring safety against damage by sun, rain, dampness, fire, theft etc. at his own cost and also employ necessary watch and ward establishment for the purpose at his cost.
- d) Materials brought to the site by the Contractor shall be deemed to be the property of the Engineer and will be under the control of the Engineer. Contractor shall not remove these materials from the site without the written permission of the Engineer.

3.2.7 RECORD OF MATERIALS

- a) The Contractor shall on demand produce to the Engineer original receipts/vouchers/ invoices in respect of the supplies. The Contractor shall ensure the materials brought to site are in sealed containers/packing's bearing manufacturers marking.
- b) The above obligations are without prejudice to the other obligations of the Contractor.

4.0 SUPPLY OF PLANT AND MACHINERY

The Contractor shall make his own arrangements at his cost for all Plant and Machinery required for execution, completion and maintenance of all items of work included in his scope of work to the complete satisfaction of the Engineer. BBJ shall neither supply any Plant and Machinery nor assist for procurement of any Plant and Machinery required for execution, completion and maintenance of works.

5.0 LABORATORY

Routine test of any construction material related to the work got done from Govt. approved laboratories/Institutions shall be borne by the Contractor.

5.1 TESTING OF MATERIALS

Necessary labour, transport and apparatus required for obtaining samples, carrying samples to the laboratory and for the conduct of tests at the laboratory shall be provided by the Contractor at his own cost.

The criteria for acceptance of work shall be results of tests carried out for work.

NOTE: All tests have to be carried out conforming to laid down IS standards or specifications or globally approved specifications as per direction of Engineer-in-Charge and shall be done at contractor's cost.

5.2 CHARGES FOR TESTING

It is re-interpreted that no additional payment shall be made to the Contractor for any testing and rate quoted shall be deemed to include all testing and other incidental expenses including at the third party tests conducted time to time on direction of engineer in charge.

6.0 TAXES AND DUTIES

6.1 The contractor shall be exclusively responsible for payment of all Taxes, Royalties etc. (except Goods and Service Tax) that may be levied from time to time according to the Laws & regulation now in force & also hereafter to be imposed, increased or modified from time to time. Nothing will be payable extra by the Company in respect of any duties/ taxes to be imposed on procurement of materials for execution of contract.

6.2 Goods and Service Tax (GST)

1.1 The quoted price shall be exclusive of Goods and Service Tax. The GST as legally leviable & payable by the bidder under the provisions of applicable law & act shall be paid extra by BBJ as per bidder's bill. **Bidder shall quote their rate after considering the input tax credit on their input materials and services.**

1.2 **HSN / SAC code must be provided against each item of Bill of Quantity (BOQ) estimated in the technical bid.**

1.3 In this works, as transfer of property of goods is involved in connection with immovable property, GST under supply of services is applicable. The bidder shall get registered with the GST authorities and the registration certificate shall be submitted along the bid documents (techno commercial). **Bid without GST number shall be cancelled.**

1.4 At present no GST-TDS is applicable. If the same is applicable in future, deduction of GST-TDS at source would be enforced from the running bills at the rates prescribed.

1.5 The GST (i.e. SGST, CGST or IGST) amount shall be shown separately in invoice and also submit proper Tax Invoice as per section 31 of CGST Act, and Rule 46 of CGST Rules, 2017 to get Input Tax Credit by BBJ.

1.6 Contractor shall raise their tax invoice in regular interval as per contract condition and uploaded their supply invoice in GSTN Portal through GSTR-1 return with 10th of next month. Mismatch in return of BBJ due to any reason attributable to bidder, the same shall be recovered from Bidder's bill.

6.3 New Levies / Taxes

In case Government imposes any new levy/tax after award of the work during the tenure of the contract, BBJ shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BBJ that such new levy / tax is applicable to this contract.

6.4 BBJ shall deduct the any other tax from the Contractor's bill at the rate as applicable as per rules framed by concerned Govt./ Local bodies from time to time and remit it to concerned department and shall issue a certificate regarding Tax/Duties/Levies so deducted on demand by the Contractor.

6.5 Implementation of – The Building and Other Construction Workers (RECS) Act, 1996 and The Building and Other Construction Workers Welfare Cess Act, 1996 in Railway Contracts: "The tenderer for carrying out any construction work in Jammu & Kashmir (name of the State) must get themselves registered from the Registering Officer under Section-7 of the Building and other Construction Workers Act, 1996 and rules made thereto by the Jammu & Kashmir (name of the State) Govt. and submit certificate of Registration issued from the Registering Officer of the Jammu & Kashmir (name of the State) Govt. (Labour Deptt.). For enactment of this Act, the tenderer shall be required to pay cess at the rate of 1% or as applicable of the cost of construction work to be deducted from each bill. The same shall be considered to have been included in the percentage rates quoted by tenderer/s in the Schedule of Items, Rates & Quantities. In case of any increase/decrease or deletion of the above Cess, the modality shall be similar as for exisitiung Tax rules & Act prevailing in India.

6.6 DEDUCTIONS OF INCOME TAX AT SOURCE

6.6.1 In terms of new section 194 C inserted by the Finance Act 1972 in the Income Tax Act 1961, BBJ shall at the time of arranging payments to the Contractor, be entitled to deduct income tax at source. The deductions towards income tax to be made at source from the payments due to the non-residents shall continue to be governed by Section 195 of the Income Tax Act, 1961.

6.6.2 PERMANENT ACCOUNT NUMBER FOR INCOME TAX

Firms should provide their PAN No. to BBJ & Project office in connection with the payments/bills.

6.7 ROYALTIES AND PATENT RIGHTS

The Contractor shall defray the cost of all royalties, fees and other payments in respect of patent rights and licenses which may be payable to any patentee, licensee or any other person or corporation and shall obtain all necessary licenses unless otherwise stated in the special conditions. In case of any breach (whether willfully or inadvertently) by the Contractor of this provision, the Contractor shall, indemnify the Railway/BBJ and their officers, staff, representatives against all claims, proceedings, damages, cost charges, acceptances loss and liability which they or any of them sustain, incur or be put by reason or in consequence directly or indirectly of any such breach and against payment of any royalties, damages and other monies which the Railway / BBJ may have to make to any person or any machine, instruments, process, articles, matters, or thing constructed, manufactured, supplied or delivered by the Contractor to his order under this contract.

7.0 PRICE ADJUSTMENT

7.1 Price adjustment shall be applicable for tenders of value more than Rs. 2.00 Crores and completion period more than 12 months and Price adjustment shall not be applicable to tenders of value less than Rs. 2.00 Crores.

7.2 Price Variation shall be applicable as per Clause No 46 A.6.(D) (for Other Works Contracts) of General Conditions of Contract, July 2014 of Northern Railway.

8.0 COMPLETION PERIOD, PROGRAMME SUBMISSION AND COMMENCEMENT OF WORK AND DELAY & EXTENSION OF CONTRACT

8.1 TIME OF START AND COMPLETION:

8.1.1 The time allowed for completion of the works is **20 (Twenty) months** from the date of issuance of Letter of Intent (LoI) or Work Order, whichever is earlier.

8.1.2 The Contractor shall be expected to commence the works within 7 (Seven) days from the date of issue of Acceptance Letter by BBJ.

8.1.3 The contractor shall be expected to complete the whole of the works ordered on the contractor, within overall 20 (Twenty) months from the date of issue of LOI by BBJ.

8.1.4 If the contractor commits defaults in commencing execution of the works as afore stated, BBJ shall without prejudice to any other right or remedy, be at liberty to forfeit fully the Earnest Money Deposit & Bank Guarantee of the contractor.

8.2 PROGRAMME OF WORKS

The tenderer shall submit with his offer a programme of works in the form of a Bar Chart of all activities in any of the Project Management software such as Primavera /MS Project, etc. In case this bar chart requires to be modified, the Engineer-in-charge and the contractor shall agree upon a time and progress chart. The chart shall be prepared in direct relation to the time stated in Appendix to Tender, for completion of the works. A tentative bar chart indicating various activities is to be enclosed at Annexure.

8.3 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 agreement between the Engineer-in-charge and the contractor within the limitation of period of completion as specified in Appendix to Tender, as overall completion period.

8.4 It shall be obligatory for the tenderer to submit his programme of work & time schedule, in such a form as to facilitate monitoring of the work using the modern networking techniques, as to how he proposes to complete the work within the stipulated date.

8.5 It shall be considered that access to site is significantly hampered during the rainy season. The Contractor shall have a certain supply of equipment and materials in reserve on site, and (because of the nature of the project and its location), just-in-time delivery should be avoided. Disruption to the road as verified by the Engineer for up to 5 days shall not be considered grounds for a time extension

8.6 In case of any delay in the completion period, the extension of the same shall be dealt as

per clause 8.7 of special condition of contract (SCC).

8.7 DELAY AND EXTENSION OF CONTRACT PERIOD

8.7.1 The time allowed for execution and completion of the works or part of the works as specified in the contract shall be strictly followed **and the time shall be essence of the contract** on the part of the Contractor.

8.7.2 As soon as it becomes apparent to the Contractor, that the work and/ or portions thereof (required to be completed earlier), cannot be completed within the period(s) stipulated in the contract as per **Key Dates (Annexure to Special Conditions of Contract)**, or the extended periods granted, he shall forthwith inform the Engineer and advise him of the reasons for the delay, as also the extra time required to complete the works and / or portions of work, together with justification therefore. In all such cases, whether the delay is attributable to the Contractor or not, the Contractor shall be bound to apply for extension well within the period of completion/extended period of completion of the whole works and / or portions thereof.

Since agreement is not reached on the extension required, the contractor is bound to the key dates and working programme valid at the moment of application of extension.

8.7.3 Extension due to modifications:

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

8.7.4 Delays not due to Employer/Contractor.

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

- (i) Any force majeure event or
- (ii) Delay on the part of other Contractors engaged directly by the Client/Employer, on whose Progress the performance of the Contractor necessarily depends or
- (iii) Any relevant order of court or
- (iv) Any other event or occurrence which, according to the Engineer is not due to the Contractor's failure or fault, and is beyond his control.

(a) The Engineer may grant such extensions of the completion period as in his opinion is reasonable.

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

8.7.5 Delays due to Employer/Engineer

In the event of any failure or delay by the Employer/Engineer in fulfilling his obligations under the contract, then such failure or delay, shall in no way affect or vitiate the contract or alter the character thereof; or entitle the Contractor to damages or compensation thereof but in any such case, the Engineer shall grant such extension or extensions of time to complete the work, as in his opinion is/are reasonable.

8.7.6 Delays due to Contractor and Liquidated Damages

- i) If the delay in the completion of the whole works or a part of the works, beyond stipulated completion period as per key dates, is due to the contractor's failure or fault, and the Engineer feels that the remaining works or the portion of works can be completed by the Contractor in a reasonable and acceptable short time, the Engineer may allow the Contractor extension or further extension of time, for completion, as he may decide, subject to the following:

- a. Without prejudice to any other right or remedy available to the Engineer, recover by way of liquidated damages and not as penalty, a sum as mentioned below:

(Note: Refer for key dates for completion of contract)

For all key dates;

Equivalent to 0.015% (Zero point Zero one five percentage) of the value of the Keydates indicated in this tender, for each week or part of a week in completion of the particular stage of the work.

This LD shall be imposed concurrently on individual intermediate periods for different stages of work and aggregated.

- b. The total amount of liquidated damages in respect of the works in all stages shall, however, **not be exceed 5% of the contract value** including the LD, if any, imposed under clause 17-B of General Conditions of Contract.
- ii) Liquidated damages recovered for failure to achieve Key Dates shall not be refunded to the Contractor.
- iii) The liquidated damages are recovered by the Employer from the Contractor for delay and not as penalty.
- iv) The actual recovery of LD imposed due to non-accomplishment of Key Dates can be deferred on submission of Bank Guarantee of requisite amount. However the recovery of this LD will be made at the rate of 10% of Gross Billed Amount from next Running Bills till such time entire amount is recovered. The bank Guarantee to be kept valid till the time entire recovery of LD is made from the Running Bills of the agency. The Format of Bank Guarantee will be submitted by the Contractor and approved by BBJ. Interest at the rate of 4.5% per Annum above the base rate of State Bank of India as effective on the date of imposition of L D recovery will also be charged from every Running Bill on the deferred recovery amount for which the Bank Guarantee has been submitted.
- v) The payment or deduction of such damages shall not relieve the Contractor from his obligations to complete the Works, or from any other of his duties, obligations or responsibilities under the Contract.
- vi) The Contractor shall use and continue to use his best endeavors to avoid or reduce further delay to the Works, or any relevant Stages/key dates.
- vii) At any time after the Employer has become entitled to liquidate damages, the Employer's Representative may give notice to the Contractor, requiring the Contractor to complete the Work within a specified reasonable time. Such action shall not prejudice the Employer's entitlements to recovery of liquidated damages, under this Sub-Clause and to terminate.
- viii) The recovery of such damages shall not relieve the Contractor from his obligation to complete the work or from any other obligation and liability under the contract.

8.7.7 Engineer's decision on compensation payable being final

The decision of the Engineer as to the compensation, if any, payable by the Contractor under this clause shall be final and binding.

8.7.8 Time to continue to be treated as the essence of contract in spite of extension of time.

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

9.0 DEFECT LIABILITY PERIOD

The Contractor shall maintain, rectify and make good at his own cost any defect/ deficiencies, which may develop in the work or as notified by the Engineer during Defect Liability Period (date of issue of completion certificate to **twelve month**) of as specified in the Appendix to Tender from the date of issue of completion certificate by the Engineer-in-charge to the contractor after satisfying himself that the works have been carried out by the contractor fully according to specifications and quality requirements and are suitable for the intended purpose. However, maintenance during Defect Liability Period shall not include day to day upkeep, cleaning, custody and security of the work.

9.1 DEFECT LIABILITY CERTIFICATE

9.1.1 In the contract, the expression "Defect Liability Period" shall mean the period of defect liability prescribed elsewhere in the contract, commencing from the date of completion of the works, as certified by the Engineer.

The Contractor shall maintain, rectify and make good at his own cost any defects/deficiencies, which may develop in the work or as notified by the Engineer during defect liability period. However, maintenance during Defect Liability Period shall not include day to day upkeep, cleaning, custody and security of the work.

9.1.2 The contract shall not be considered as completed, until a Defect Liability Certificate has been issued by the Engineer stating that the works have been completed and maintained to his satisfaction. Defect Liability certificate shall be issued by the Engineer, upon expiry of Defect Liability period or as soon thereafter as any works ordered during such period, have been completed to the satisfaction of the Engineer.

9.1.3 No certificate other than "Defect Liability Certificate" shall be deemed to constitute final approval of the work or part of the work for which it is issued.

10.0 Insurance

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 for the following requirements:

- a) Contractor's All Risk (CAR) Policy, which will cover the third party damages if any (to the houses/structure in vicinity of the site) and the compensation if any to the residence/local bodies shall be paid under CAR policies.
- b) Liability for death of or injury to any person or loss of or damage to any property (other than the work) arising out the performance of the Contract.
- c) Construction Plant, Machinery and Equipment brought to site by the Contractor.
- d) Contractor should suitably ensure to cover the executed works under appropriate insurance against natural and un-natural calamities.
- e) Any other insurance cover as may be required by the law of the land.

All insurance policies entered into by the contractor under the contract, shall stipulate that the proceeds of all claims shall be payable to the Engineer (THE BBJ CONSTRUCTION CO. LTD..) The Engineer shall reimburse such claims to the contractor when the contractual obligations are completed by him.

All insurance covers referred to in the Contract shall effect with an Indian Insurance Company incorporated and registered in India.

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

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

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

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

If the Contractor fails to effect or keep in force or provide adequate cover as acceptable to the Engineer in the insurance policies mentioned above, then in such cases, the Engineer may effect and keep in force any such insurance or further insurance on behalf of the 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.

11.0 GENERAL DESCRIPTION OF SITE AREA & CLIMATIC CONDITIONS

- 11.1 The alignment traverses through steeply sloping, highly undulating hill slopes of younger Himalayas.
- 11.2 The regional Geology and tectonic framework of the area indicates that the region is capable of generating earthquake. The area falls in seismic zone-V of Indian standard seismic zoning map of the country. No claim regarding bad climatic condition shall be entertained during the period of contract.
- 11.3 The J&K State climatically is distinctly divided in three parts namely the Jammu region, the valley region and the Leh-Ladakh region. The climate in the project area for most parts of the year is temperate. During the winter season the minimum temperature drops down below zero degree and snowfall in the project area is quite predominant.
- 11.4 The rainfall in the project area is affected by western disturbances from December to May. While there is rainfall throughout the year in the valley, March is generally the wettest month and November is the driest. The CONTRACTOR is advised to satisfy himself by his actual inspection of the site and also ascertain for himself the climatic condition records from state government and/or Indian Meteorological Department before submitting the tender.
- 11.5 Bridge No.2 and 3 is located at Sumber station yard at Sumber Village, Ramban District, J&K and Bridge no. 61 over Tutsun nallah of Katra-Quazigund Section of USBRL Project.
- The terrain of bridge location for is hilly and has steep gradient on the access roads. The proposed Bridges is located in between Tunnel and is to be constructed across the nalla which is generally flowing with water almost throughout the year and heavy water flows only during due to rains.
- 11.6 The regional geology and tectonic framework of the area indicates that the region is capable of generating earthquake. The area falls in seismic zone-V of Indian Standard seismic zoning map of the country.
- 11.7 The rainfall in the project area is affected by western disturbances from December to May. While there is rainfall throughout the year in the valley, March is generally the wettest month and November is the driest.

12.0 INSPECTION OF SITE AND SITE DATA

In addition to the provision in General Conditions of Contract following is also mandated:

- i) The Employer/Engineer shall make available with tender documents such data on hydrological and sub surface conditions, if any, obtained from investigations undertaken relevant to the works. The tender shall be deemed to have been based on such data, if provided, but the contractor shall be responsible for his own interpretation of all such data.
- ii) The Contractor shall be deemed to have inspected and examined the site and information available in connection therewith and to have satisfied himself fully before submitting his bid about the subsurface conditions, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the works, the means of access to the site and accommodation he may require. He shall also be deemed to have obtained all necessary information regarding risks, contingencies and all other circumstances which may influence or affect the contract.

13.0 APPROVAL / CLEARANCES - GENERAL OBLIGATIONS OF THE CONTRACTOR

13.1 Site Operations and Methods of Construction:

In addition to provisions in General Conditions of Contract following is also mandated:

The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and method of construction. Provided that the Contractor shall not be responsible for the design and specifications of Permanent works or for the design or specifications of any temporary works provided by the Engineer. Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall be fully responsible for that part of such works, notwithstanding any approval by the Engineer.

13.2 Appraisal of Errors / Omissions in the Drawings:

In addition to provisions in General Conditions of Contract following is also mandated:

The Contractor shall promptly inform in writing to the Engineer of any error, omission, fault and other defects, in the design, drawings or specifications for the works which are noticed while reviewing the Contract documents or in the process of execution of the works.

13.3 Contract Agreement:

The Contractor shall enter into and execute the Contract Agreement in the form of agreement (**as per Annexure**) within 28 days after the date of issue of Letter of Acceptance. The stamp papers of the requisite value as per the prevailing laws shall be provided by the Contractor at his own cost. Original Agreement shall be retained by the Employer/Engineer and a certified copy shall be made available to the Contractor.

14.0 PLANT & MACHINERY ADVANCE

14.1 Not applicable for this contract.

15.0 Performance Security & Retention Money:

15.1 For contracts value upto Rs.1.00 Crore, no performance security shall be required to be submitted by the Contractor. For contracts value more than Rs.1.00 Crore

- i) The successful bidder shall submit a Performance Bank Guarantee (PG) in the form of irrevocable bank guarantee (format to be provided later) from any Nationalised Bank or Scheduled Bank **for an amount of 5% (Five percent) of the contract value**. The value of PBG to be submitted by the Contractor will not change for variation value of contract upto 25% (either increase or decrease). In case during the course of execution, value of contract increases by more than 25% of the original contract value, an additional Performance Guarantee amounting to 5% (five percent) for the excess value over the original contract value should be deposited by the contractor.
- ii) Performance Bank Guarantee (PBG) shall be submitted by the successful bidder after the letter of Intent (LoI) has been issued, but before signing of the agreement. The agreement should normally be signed within 28 days after the issue of LOI and the PBG shall also be submitted within this time limit. This guarantee shall be initially valid up-to the stipulated date of completion plus 60 days beyond that. In case, the time for completion of work gets extended, the contractor shall get the validity of PBG extended to cover such extended time for completion of work plus 60 days.
- iii) No payment under the contract shall be made to the Contractor before receipt of PBG.
- iv) Failure of the successful bidder to furnish the required PBG shall be a ground for the annulment of the award of the Contract and forfeiture of the Earnest Money Deposit.

15.2 Retention Money

- i. Retention money for all contracts shall be recovered from on account / final bills of the Contractor **@ 10% of gross value of each bill** after adjusting Earnest Money Deposit (EMD) amount till the amount so recovered including EMD amount adds up-to 5% of the contract value of the work.
- ii. No interest shall be payable to the Contractor on the amount retained in cash towards retention money.

15.3 Release of Performance Security:

- a) Performance Bank Guarantee shall be returned to the Contractor, subject to the issue of Completion Certificate by the Engineer in accordance with relevant clauses. This shall not relieve the Contractor from his obligations and liabilities, to make good any failures, defects, imperfections, shrinkages, or faults that may be detected during the defect liability period specified in the Contract.
- b) Wherever the contract is rescind, the security deposit shall be forfeited and the Performance Bank Guarantee shall be encashed and the balance work shall be got done independently without risk and cost of the failed contractor. The failed contractor shall be debarred from participating in the tender for executing the balance work. If failed contractor is a partnership firm, then every member/partner of such firm shall be debarred from participating in the tender for executing the balance work either in his/her individual capacity or as a partner of any other partnership firm;
- c) The Engineer shall not make a claim under the Performance Bank Guarantee (PBG) except for amounts to which BBJ is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:-
 1. Failure by the contractor to extend the validity of the PG as described herein above, in which event the Engineer may claim the full amount of the PG.
 2. Failure by the contractor to pay BBJ any amount due, either as agreed by the contractor or determined under any of the Clauses/ Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer.
 3. The contract being determined or rescinded under provision of the GCC, the PG & EMD alongwith the retention money deducted from RA bills shall be forfeited in full and shall be absolutely at the disposal of the Engineer.

15.4 Release of Retention Money:

- i) The Retention Money shall be released to the Contractor after preparation of final bill and acceptance of the same by the Contractor and **after the expiry of the defect liability period** specified in the Contract, reckoned from the date on which the Engineer shall have issued the Certificate of Completion comprising the whole of works. The retention money shall be released after all failures, defects, imperfections, shrinkages and faults have been rectified by the Contractor to the satisfaction of the Engineer and Defect Liability certificate is issued by the Engineer.
- ii) **Release of 50% Retention Money Against Bank Guarantee:**
 - A) For contracts valuing less than Rs. 30 Crores:**

If requested by the contractor, 50% of the Retention money may be released on satisfactory completion of works against submission of Bank Guarantee for an equivalent amount by the Contractor in the Performa annexed as Annexure from any scheduled Bank in India. This Bank Guarantee shall be kept valid till the period of three months beyond the expiry of Defect Liability Period. Fixed Deposit Receipt (FDR) from a scheduled bank endorsed in favor of the Employer can be submitted by the Contractor in lieu of the Bank Guarantee for release of 50% Retention Money.
 - B) For contracts valuing Rs. 30 Crores or more:**

If requested by the contractor, 50% of the Retention money may be released at a stage when full amount of retention money (i.e. 5% of the contract value) has been recovered at the stage when not less than 50% financial progress has been achieved against submission of Bank Guarantee for an equivalent amount by the Contractor in the performa annexed as Annexure from any scheduled Bank in India. This Bank Guarantee shall be kept valid till the period of three months beyond the expiry of Defect Liability Period.
- iii) Where different defect liability periods are applicable to different parts of the works, the expression - "expiration of the defect liability period" shall for the purpose of this clause be deemed to mean the expiry of last of such periods.

16.0 PRICES AND PAYMENT TERMS

16.1 MONTHLY ON ACCOUNT PAYMENTS

- 16.1.1 On account payment will be made monthly. 75% of the amount, incorporating usual recoveries, will be released within 14 days from submission of bill by the contractor on the prescribed format. The balance 25% will be releases within 28 days from submission of bill after detailed scrutiny.
- 16.1.2 In case of detection of wrong or exaggerated amount in the submission of bills, the contractor will be levied a penalty of a sum of Rs. 1 lakh and Rs. 2 lakh at the first and second instant respectively. For any further repetition of such lapses he shall forfeit the facility of adhoc-payment as provided above.
- 16.1.3 Payment for the work done will be made to the contractor only when the formal agreement has been executed between the parties.

16.2 PAYMENT TERMS

- 16.2.1 **Payment will made as per condition mentioned in Price Schedule including issued corrigendum.** The contractor shall be allowed one **Running Account payment** each month and payment shall be made upon verifications of measurements and works carried out in conformity with specifications and quality requirements after deducting dues on account of mobilization advance paid to the contractor, security deposit, Income Tax at sources etc. and any other dues that may have accrued.
- 16.2.2 All items of work having a financial value shall be entered in Measurement Book, Level Book etc., so that a complete record is obtained for all work performed under the contract. The Contractor shall be authorized to depute his representative for joint measurement of works.
- 16.2.3 Running Account payments to the contractor shall be through Account Payee Cheque/ NEFT/RTGS. The contractor shall provide NEFT/RTGS code of their banks with A/c No for release of payments.
- 16.2.4 No material price variation or wages escalation on any account whatsoever the compensation for 'Force Majeure" etc. shall be payable under this contract except price escalation clause payable as per price escalation clause if any, provided separately in the tender documents.
- 16.2.5 The rates for any item of work not included in the (Schedule of rates and quantities) and which the contractor may be called upon to do by BBJ shall be fixed by the supplementary written agreement between the contractor and the BBJ before the particular item or items of work is/are executed. In the event of such agreement not being entered into and executed the BBJ may execute these works by making alternative arrangements. BBJ will not be responsible for any loss or damages on this account.
- 16.2.6 Payment for the work done will be made to the contractor only when the formal agreement has been executed between the parties.
- 16.3 Mode of Payment:**
- 16.1 All payments to the contractors shall be made through through Account Payee Cheque / Electronic Clearing System (ECS). The contractor shall furnish his Banker's details in addition to his own bank account details. All amounts payable to the contractor shall be directly credited to his bank account.
- 16.2 In case, the contractor is having his account with a bank not having Electronic Clearing System (ECS), the contractor may open a bank account with the bank having this facility.
- 16.3 All payments to the contractor shall be made by above means only unless specifically otherwise agreed by the Engineer in special circumstances for petty payments.

16.4 FINAL MEASUREMENTS AND PAYMENTS

As soon as possible after completion of work, the contractor shall submit the final bill along with detailed measurements of work done, accountal of the materials, plant and machinery issued by the engineer and all other statements, supporting documents required for finalization of the bill. The final bill, measurements and documents submitted by the contractor shall be scrutinized by the Engineer or his representative and in case the same are found not in order, the Engineer shall direct the contractor to resubmit the final bill along with all details. On receipt of all requisite details and final bill from the Contractor, the engineer shall have the final measurements taken, recorded and signed jointly. An accountal of any plant, equipment and materials issued by the Engineer to the Contractor, shall also be prepared and signed jointly. Based on the final measurement s and materials and plant and equipment accountal statements, the Engineer shall prepare the final bill.

The contractor shall sign the Engineer's copy of the Final Bill Account in token of acceptance of the full and final value of the works performed under the contract, and submit a "No Claim Certificate" on the prescribed proforma along with a list of unsettled claims, if any. The Engineer shall then arrange to make payment against the final bill.

17.0 VARIATION IN QUANTITY:

- i) The quantities of items shown in the bill of quantities are approximate, and liable to vary during the actual execution of the work. The contractor shall be bound to carry out and complete the stipulated work, irrespective of the variations in individual items, specified in the bill of quantities.
- ii) Such variations in quantities shall be paid for in the manner laid down below:
 - (a) In case the variation in individual items goes beyond (+) 25% in respect of the specialized nature of works like tunneling works, Earthwork including rock blasting in hilly terrain for construction of access roads and the consequential works like protection works etc., where it is not possible to prepare fairly accurate estimate of quantities before award of the contract and it is not practical to bring a new agency for doing the increased quantity of work beyond (+) 25% variation, 1% reduction in the accepted rate will be effected for payment to the contractor beyond (+) 25% variation and up-to (+) 50% variation.
 - (b) In other works where it is generally possible to work out fairly accurate estimate before award of the contract, 2% reduction in the accepted rate will be effected beyond (+)25% variation and upto (+) 50% variation. For the present tender, this sub-clause(b) will be applicable.
 - (c) In case the variations in individual items is more than (+) 50%, the rate for the increased quantities beyond (+) 50% shall be negotiated between the Engineer and the Contractor. Provided further that for the quantities exceeding (+) 50% of each item of Bill of Quantities, the Engineer shall have a right to get these executed from any other agency or by his own labour, materials and resources.
 - (d) Decrease in quantity of individual items up to (-) 50% due to site conditions shall not form ground for revision of rates or claim on this account. Beyond (-) 50% variation, rate shall be negotiated between the Engineer and the contractor.
 - (e) The above limit of variation shall not be applicable for small value items and no negotiations for rates for such items shall be done. Small value items shall be those items whose sum, starting from the lowest value items, is up-to 2% of the original contract value and shall be decided between the Engineer and the contractor.
 - (f) As far as BOQ/SOR items are concerned, the limit of 25% would apply to the value of BOQ/SOR schedule as a whole and not on an individual BOQ/SOR items. However, in case of NS items, the limit of 25% would apply on the individual items irrespective of the manner of quoting the rate (single percentage rate or individual item rate).

18.0 SAFETY OF PUBLIC AND PUBLIC UTILITIES

In addition to provisions in General Conditions of Contract following is also mandated:

- i) Existing road or water courses or any other utility shall not be blocked, cut through, altered, diverted or obstructed in any way by the Contractor, except with the permission of the Engineer. All compensation claimed by any Department/Organization for any unauthorized closure, cutting through, alteration, diversion or obstruction to such roads or water courses by the Contractor or his staff shall be recovered from any moneys due to the Contractor.
- ii) During progress of work in any street or thoroughfare, the Contractor shall make adequate provision for the passage of traffic, for securing safe access to all premises approached from such street or thoroughfare and for any drainage. Water supply, sewer lines, Electrical and Telecommunication cables/wires etc. which may be interrupted by reason of execution of works shall be protected/diverted and maintained by the Contractor at his own cost. Barriers, lights and other safeguards as prescribed by the Engineer for the regulation of traffic including watchmen necessary to prevent accidents shall be provided by the Contractor at his own cost.
- iii) The contractor shall be responsible for taking all precautions to ensure safety of the public utilities and public in the vicinity of works and shall post such watchmen at his own cost as may, in the opinion of the Engineer, be necessary to comply with the regulations applying to the work and to ensure safety.
- iv) Should the Contractor fail to implement the provisions as required in the above sub-clauses, the Engineer may provide necessary arrangements and the cost of the same shall be recovered from the Contractor's payments/dues.

19.0 OTHER SAFETY PROVISIONS

In addition to provisions in General Conditions of Contract following is also mandated:

19.1 Safety of Labour and others

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

19.2 Safety of works

The Contractor shall provide and maintain at his own cost, all lights, guards, signage, signalmen, fencing and watching arrangements when and where necessary, or as required by the Engineer for the protection of the works or for safety and convenience of those employed on works or of the public.

19.3 Mere observance of these precautions shall not absolve the contractor of his liability in case of loss or damage to property, or injury to or death of any employee/labour of Contractor, Client or Employer/Engineer or any member of the public.

19.4 Recovery of the cost from the Contractor

Should the Contractor fail to implement the provisions as required in the preceding sub-clauses 21.1 & 21.2, the Engineer may provide necessary arrangements and the cost of the same shall be recovered from the Contractor's payments/dues.

20.0 PROTECTION OF ENVIRONMENT

During execution of works, the Contractor shall abide at all times by all existing enactments on environmental protections and rules made there under, regulations, notifications and bye-laws of the State or Central Government or local authorities and any other law, bye-law, regulation that may be issued in this respect in future by the State or Central Government or local authority. Salient features of some of the laws that are applicable are given below:-

- i) The Water (Prevention and Control of Pollution) Act, 1974. This provides for the prevention and control of water pollution and maintaining and restoring of

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

- ii) The Air (Prevention and Control of Pollution) Act, 1981. This provides for prevention, control and abatement of air pollution. "Air Pollution" means the presence in the atmosphere of any "air pollutant", which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.
- iii) The Environment (Protection) Act, 1986. This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. Environment includes water, air and land and the inter-relationship which exists among and between water, air and land, other living creatures, plants, micro-organism and property.
- iv) The Public Liability Insurance Act, 1991. This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act, 1986, and exceeding such quantity as may be specified by notification by the Central Government.

21.0 IMPLEMENTATION OF QUALITY, SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT SYSTEM:

- 21.1 The Contractor shall follow and implement Quality, Management System as per IS / ISO 9001:2008 and Quality Policy of IRCON & BBJ.
- 21.2 The Contractor shall execute the work as per Safety, Health, and Environment Specifications of BBJ. Contractor shall provide and ensure the use of safety, gadgets, like Safety-shoes, helmets, gloves, jackets, mask etc. as required for all workers and staff. The Contractor shall provide and erect safety barricades as required, display safety posters and instructions regarding safety.
 - a) The Contractor shall prepare a Project Safety Manual and get it approved by the Project Head. The Contractor' will own the ultimate responsibility of all aspects of Safety, Health and Environmental upkeep of the work place and its surroundings.
 - b) The Contractor will facilitate safety checks and checks on compliance to all the norms as per the SHE Manual by PH or the nominated Safety Officer at regular interval.
 - c) The Employer may, at their discretion undertake such corrective measures as deemed fit for immediate restoration of safe: conditions at the: work place at the cost of the Contractor and recover the-cost from Contractor's running bills. The contractor will keep the- Employer indemnified against any corrective action by the Employer. In addition to such recourse, the penalty for each violation will be enforced as under, without issuing- any show cause notice for same.

SI. No.	Nature of Violation	Penalty
1	None preparation of Site Safety Plan before the first running bill.	Rs.10,000.00
2	Violation of safety norms pointed out by inspecting officials, such as deficient documentations or safety gadgets or lack of supervision / process control etc.	Rs.10,000.00 for each violation subject to maximum 1% of the contract value in all.
3	Injury to workers leading to stoppage of work.	Rs.25,000.00 for each case
4	Fatalities to workers at work related accidents	Rs. 5 lac for each mortality
5	Repetition of violation.	May lead to termination of work.

21.3 The Contractor shall arrange timely calibration of all his measuring and testing equipment's at his own cost from reputed laboratory and supply of calibration certificates to the Engineer.

21.4 The Contractor shall ensure maintenance and overhauling of all his plant and machinery as per guidelines issued by manufacturer Vendor/Engineer.

21.5 The Contractor shall arrange the test certificates issued manufacturers of materials supplied by him and also arrange the testing of materials from approved laboratory at his own cost, as required, and submit the test certificates to the Engineer.

21.6 The contractor shall provide work instructions/ check lists for proper execution of work.

21.7 The contractor shall also maintain all relevant records and documents properly and same shall be made available to the Engineer as required.

22 ORDER OF PRIORITY OF CONTRACT DOCUMENTS

Where there is any conflict between the various documents in the contract, the following order of priority shall be followed i.e. a document appearing earlier shall override the document appearing subsequently:

- 1) Agreement, Work Order
- 2) Letter of Acceptance of Tender
- 3) Notice Inviting Tender
- 4) Instructions to the Tenderers
- 5) Appendix to Tender
- 6) Form of e-Bid
- 7) Special Conditions of the Contract
- 8) General Conditions of Contract
- 9) General Technical Specifications
- 10) Relevant Codes and Standards
- 11) Drawings
- 12) Bill of Quantities

FORM OF AGREEMENT

(To be executed on requisite value of stamp Papers)

AGREEMENT

THIS AGREEMENT made on _____ day of _____ (Month/year) between **THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED** (hereinafter called "the Employer/Engineer") of _____ (name and address of the Contractor) (hereinafter called "the Contractor") of the other part.

WHEREAS the Employer is desirous that work of "....." should be executed by the Contractor viz. **ContractNo.**_____ (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:
 - a) Letter of Acceptance of Tender
 - b) Notice Inviting Tender
 - c) Instructions to the Tenderers
 - d) Appendix to Tender
 - e) Form of Bid
 - f) Special Conditions of the Contract
 - g) General Technical Specifications
 - h) General Conditions of Contract
 - i) Relevant Codes and Standards
 - j) Bill of Quantities
 - k) Drawings
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement executed the day and year first before written

(Name, Designation and address of the the authorised signatory)
Signed for and on behalf of the contractor in the presence of in the presence of

(Name, Designation and address of the authorised signatory)
Signed for and on behalf of the the Employer in the presence of

Witness

1. _____
2. _____

(Name and address of the witnesses to be indicated)

Witness

1. _____
2. _____

CERTIFICATE OF FAMILIARISATION

- A. I/We hereby solemnly declare that I/We have visited the site of work and have familiarized myself/ourselves of the working conditions there-in all respects and in particular, the following:
- a) Topography of the Area.
 - b) Sources & availability of man power.
 - c) Availability of local labour, both skilled and unskilled and the prevailing labour rates.
 - d) Availability of water & electricity.
 - e) The existing roads, bridges, culverts and access to the site of work.
 - f) Availability of space for putting labour camps. Officers, stores, godown, engineering yard etc.
 - g) Climatic condition and availability of working days.
 - h) Political environment and law & order situation of the project/camp area.
 - i) Soil conditions at the site of work
- B. I/We have kept myself/ourselves fully informed of the provisions of this tender document comprising Instructions to the Tenderers, General Conditions of the Contract, Special Conditions, Specifications and Additional special conditions apart from information conveyed to me/us through various other provisions in this tender document.
- C. I/We have quoted my / our rates as 'Percentage above / at par "of total cost as per Schedule of Items Rates and Quantities (BOQ) in TENDER DOCUMENT taking into account all the factors given above.

(Signature of Tenderer/s)

UNDERTAKING BY TENDERER

1. Being duly authorized to represent and act on behalf of and having fully understood all the tender conditions and requirements for fulfilling eligibility criteria including residual / available bid capacity, the undersigned hereby declare that:
- i) The information/ statements given in support of technical and financial capability as per Technical eligibility criteria (at page no. 6 of tender document) are true and correct in every detail.
 - ii) This tender offer is made in the full understanding that:
 - a) All information / documents submitted along with tender offers by tenderer/s will be subject to verification by THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED or its any authorized representative who may conduct any inquiries or investigations to verify the statements, documents and information submitted in connection with the tender offer and to seek clarification from our bankers, clients regarding any financial & technical aspects;
 - (b) In the event that the information/document submitted is found to be false or misleading, the tender shall be disqualified and the earnest money deposited shall be forfeited.
2. The client reserves the right to:
- (i) Reject or accept any application, cancel the tender and reject all applications.

Signed

Name

For & on behalf of Name of
Firm/Company

Key dates of different activities for Completion of Superstructure of Bridge No. 2, 3 & 61

S NO	Description	2017												2018												2019		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
<u>1</u>	Submission of QA & QC																											
<u>2</u>	Procurement of structural steel for manufacturing of steel girder																											
<u>3</u>	Inspection and testing of structural steel as per QA & QC at factory																											
<u>4</u>	Fabrication and Assembly of steel girder at factory.																											
<u>5</u>	Metallizing / Sand blasting with primer and one coat paint at factory.																											
<u>6</u>	Transportation of steel girder as per approved methodology to the site and keeping at proper platform																											
<u>7</u>	Assembly of steel girder in full length at site.																											
<u>8</u>	Erection/launching of girder as per approved methodology																											
<u>9</u>	Final coat of painting after launching of girder																											
<u>10</u>	RCC deck slab																											
<u>11</u>	Rainwater pipe/Railing/Expansion Joint etc.																											

THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED

eNIT/DGM(P-V)/Br.no.2,3&61/J&K/2149/3130/R1/54-2017

DATE: 31.07.2017

Programme of execution of works shall be submitted by the Tenderer/s along with the technical bid in line with the key dates mentioned hereunder:

Note: The Contractor shall be required to make good progress, to meet the contractual Key dates as mentioned below.

Activity ID	Stage	Calendar Days	Percentage of OCV for Calculation of Penalty
LOA	Letter of Acceptance	D	
KD01	Submission of QA & QC	D+60	5%
KD02	Procurement of Structural steel for manufacturing of steel girder for (a) 5 Track Spans of Bridge No. 2 (b) 3 Track Spans of Bridge No. 3 (c) 1 Track Spans of Bridge No. 61	D+120	15%
KD03	Fabrication,metallising, Painting etc. complete and transportation to site (a) 5 Track Spans of Bridge No. 2 (b) 3 Track Spans of Bridge No. 3 (c) 1 Track Spans of Bridge No. 61	D+210	15%
KD04	Procurement of Structural steel for manufacturing of steel girder for (a) 5 Track Spans of Bridge No. 2 (b) 4 Track Spans of Bridge No. 3 (c) 1 Track Spans of Bridge No. 61	D+240	15%
KD05	Fabrication,metallising, Painting etc. complete and transportation to site (a) 15 Track Spans of Bridge No. 2 (b) 11 Track Spans of Bridge No. 3 (c) 2 Track Spans of Bridge No. 61	D+304	10%
KD06	Procurement of Structural steel for manufacturing of steel girder for (a) 22 Track Spans of Bridge No. 2 (b) 16 Track Spans of Bridge No. 3 (c) 3 Track Spans of Bridge No. 61	D+335	10%
KD07	Fabrication,metallising, Painting etc. complete and transportation to site (a) 22 Track Spans of Bridge No. 2 (b) 16 Track Spans of Bridge No. 3 (c) 3 Track Spans of Bridge No. 61	D+485	10%
KD08	Completion of Deck slab for all bridges	D+669	10%
KD09	Rainwater pipe/Railing/ Expansion joint & commissioning site clearance and completion of all works	D+730	10%

NOTES:

- The key dates give the latest start/end of every activity mentioned. The contractor shall prepare the working program anticipating the start/end of the mentioned activities according to its need regarding the interaction of said activities The key dates are with inbuilt float. The agency will have to take this float into consideration while preparing work program.
- There will be visits by N. Rly Officials, Consultants for the project/ Proof Consultants for the project, which has to be taken into account while working out the time schedule. The agency will be liable to provide all support to the consultants & clients of the project.
- The agency will have to take into consideration time lost due to various factors such as rainfall, High wind speed at the desired altitude while working out the time schedule.
- From LOA, the overall total completion period for entire work will be 16 Months.
- Track span means one span of a bridge carrying one track.

CHAPTER-VIII

GENERAL TECHNICAL SPECIFICATIONS

1. Introduction

1.1 Scope of the document

Scope of the present Technical Specifications is to provide integrations to the content of the following listed General Specifications (to which the contractors have to refer for all the topics not explicitly covered by the present document):

1. Manual of Standards and Specifications for Indian Railway EPC Contract for New lines/Doubling (2014)
2. Indian Railways Unified Standard Specifications (Works and Materials), amended up to date

The provided integrations refer to specific works related to the project and specially requested because of its peculiarities.

In the event of contradiction between the above mentioned General Specifications (1.& 2.)and this document, the provisions of these technical specifications shall prevail.

This Technical Specifications document, in conjunction with the General Specifications, sets out the basic standard of quality of materials and workmanship required by the Employer and shall be the reference and basis for the acceptance by the Engineer of any material and workmanship provided by the Contractor or on any work completed under the Contract.

In general, the requirements of the Specification shall be considered as minimum requirements.

1.2 Definitions and Acronyms

1.2.1 Definitions

1.2.1.1 The Engineer

The term Engineer used in this Specification refers to the Engineer appointed by the Authority for the purpose of the Contract.

1.2.2 Acronyms

BG	Broad Gauge
CDA	Coefficient of Dynamic Augment
HPDE	High density Polyethylene extrusion
HSFG	High Strength Friction Grip
IRS	Indian Railway Standards
IS	Indian Standards
IRC	Indian Roads Congress
LL	Live Loads
LWR	Long Welded Rail
MBG	Modified Broad gauge
OHE	Overhead Equipments
PTI	Post Tensioning Institute
RDSO	Research Designs and Standards Organisation
SDL	Super Imposed Dead Loads
SEJ	Switch Expansion Joint
UIC	International Union of Railways
ULS	Ultimate Limits States
RCC	Reinforced Cement Concrete
TMT	Thermo Mechanically Treated Bars

2.0 REFERENCES

2.1 Codes and specifications

For technical specifications, refer to:

- Indian Railways Unified Standard Specifications (Works and Materials), 2010 amended up to date.
- RDSO Guidelines for earthwork in railway projects - Guideline No. GE: G-1 - July 2003

The Indian Railways have a set of codes and standards for the design and construction of railway bridges in India (IRS Standards). The IRS standards shall be supplemented by other Indian Standards (IS) and international codes which provide some additional coverage. Below, key standards for the superstructure bridges 2 and 3 are listed.

Superstructure

- EN 1992-1-1: Design of concrete structures - Part 1.1: General rules and rules for buildings
- EN 1992-2: Design of concrete structures - Part 2: Concrete bridges - Design and detailing rules
- EN 1993-1-1: Design of steel structures - Part 1.1: General rules and rules for buildings
- EN 1993-1-5: Design of steel structures - Part 1.5: Strength and stability of planar plated structures without transverse loading
- EN 1993-2: Design of steel structures - Part 2: Steel bridges
- EN 1994-1-1: Design of composite steel and concrete structures - Part 1.1: General rules and rules for buildings
- EN 1994-2: Design of composite steel and concrete structures - Part 2: Rules for bridges
- IS 2062 – 2006: Hot rolled low, medium and high tensile structural steel IS 800- 2007: General construction in steel – code of practice
- IS 456: Plain and reinforced concrete – Code of practice IS 1786 – 1985: Specification for high strength deformed steel bars and wires for concrete reinforcement

Bearings:

- EN 1337-1: Structural bearings – Part 1: General design rules
- EN 1337-5: Structural bearings – Part 5: pot bearings

Substructures

- IRS – Bridge sub-structures & foundation code: code of practice for the design of sub-structures and foundations of bridges
- IRS - Concrete Bridge Code 1997: Code of practice for plain, reinforced, & prestressed concrete for general bridge construction

Loads

- IRS – “Bridges Rules”: Rules specifying the loads of super-structure and substructure of bridges
- IS 875(Part3): Wind Loads on Buildings and Structures
- IS 875(Part5): Special Loads and combinations
- IS 1893 – 1984: Criteria for earthquake resistant, design of structures
- EN 1990: Basis of structural design
- EN 1991-1-5: General actions – Thermal actions
- EN 1998-1: General rules, seismic actions and rules for buildings
- EN 1998-2: Bridges

For all other standards not listed above and for items not covered by the Indian Railways Unified Standard Specifications or this technical specification, the order of priority of applicable standards and guidelines shall be:

- Indian standard as identified by the Engineer
- EUROCODE as identified by the Engineer
- Any applicable international standard or guideline as identified by the Engineer

3.0 TECHNICAL SPECIFICATIONS

3.1 General guidelines regarding specifications and special conditions for supply of cement for construction works

3.1.1 Supply of cement:

Supply of cement to various specifications as required will be paid under the items in Schedule if not included in items rate taken in schedule only.

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.

For supply and use of cement in various works, relevant Indian Railways Unified Standard Specifications (Works and Materials), Volume I & II - 2010, IRS codes and IS Specifications will be applicable.

Wherever, relevant specifications are not available, decision of the Engineer shall be final and binding on the contractor.

3.1.2 Specifications for cement:

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

- (i) 33 Grade Ordinary Portland Cement conforming to IS: 269
- (ii) 43 Grade Ordinary Portland Cement conforming to IS: 8112
- (iii) 53 Grade Ordinary Portland Cement conforming to IS: 12269
- (iv) Rapid Hardening Ordinary Cement conforming to IS: 8041
- (v) High Strength Portland Cement conforming to IRS: T: 40
- (vi) Hydrophobic Portland cement conforming to IS: 8043
- (vii) Low heat Portland cement conforming to IS: 12600
- (viii) Sulphate Resistance Cement conforming to IS: 12330

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

3.1.3 Test certificate regarding quality of cement:

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.

EMPLOYER 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.

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

- i. Compressive strength
- ii. Initial and final setting time
- iii. Consistency
- iv. Soundness.
- v. Fineness

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 EMPLOYER and take approval of the EMPLOYER before using in work. No extra payment will be made for conducting such tests.

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 EMPLOYER will only provide suitable land wherever land is available and is free for use. On completion of the work or as directed by the Engineer, the shed if put up by the Contractor, should be removed by the contractor and site cleared at his cost.

3.1.4 Consumption of cement

The cement consumption for other than design mix concrete, shall be as per Standard Schedule of Rates items 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.

3.1.5 Payment for cement

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

3.1.6 General

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

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.

53 Grade/43 Grade/33 Grade of cement should be stacked separately in countable manner. 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.

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.

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

3.2 General guidelines regarding specifications and special conditions for concrete works:

3.2.1 Specifications

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

IRS Concrete Bridge Code.

IS 456: Code of Practice for Reinforced Concrete.

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

Relevant IRS/IRC/IS Specifications/Codes

Specifications for cement, steel, 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.

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.

3.2.2 Cement

The cement used in concrete construction shall be 53 Grade Ordinary Portland Cement as per the design and as specified in the relevant schedules. Specifications for cement are covered under the supply schedule.

3.2.3 Reinforcement

All Reinforcement Steel (TMT Bars of Grade Fe 500) shall be procured as per specification mentioned in IS : 1786. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the Specifications. These steel shall be procured only from those firms, which are Established, Reliable, Indigenous & Primary Producers of Steel, having Integrated Steel Plants (ISP), using iron ore as the basic raw material and having in 'house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's guidelines.

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.

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

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 EMPLOYER 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 EMPLOYER shall be binding on the contractor for the purpose of payment and no dispute will be entertained by EMPLOYER on this account.

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

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

3.2.4 Coarse & fine aggregates

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.

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

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

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.

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.

3.2.5 Water

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.

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).

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.

3.2.6 Admixtures

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

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.

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

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.

3.2.7 Storage of materials

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.

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.

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 EMPLOYER. For more details regarding stacking and storage of cement, refer clause 17.10.1, 17.10.2 and 26.1.2.7 of IRUSS (W& M), Volume II, - 2010.

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.

3.2.8 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.

3.2.9 Concreting

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.

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.

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

3.2.10 Weigh batching, vibrating, curing & testing

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.

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.

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, EMPLOYER 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.

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.

3.2.11 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 540kg/m³.

(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 are 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 impermeability.

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

As a trial the manufacturer of concrete may prepare a preliminary mix according to provisions of SP: 23-1982. (Special Publications 23-1982 of Bureau of Indian Standards) Mix design shall be tried and the mix proportions checked on the basis of tests conducted at a recognized laboratory approved by the Engineer. All concrete proportions for various grades of concrete shall be designed separately and mix proportions established keeping in view the workability for various structural elements, methods of placing and compacting.

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

Max size of Aggregate, Target Mean Strength			
Grade of Concrete	Max size of Aggregate (mm)	Characteristic Strength (fck) at 28 days (N/mm ²)	Target Mean Strength (fck) 28 days (N/mm ²)
M20	20	20	26.6
M25	20	25	31.6
M30	20	30	38.25
M35	20	35	43.25
M40	20	40	48.25
M45	20	45	53.25

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

2.2.12 Requirements of Consistency

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

Slump Required for workability:

SI No	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.

3.2.13 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:

Enviroment	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 the guidance.

3.2.14 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	0.5	0.45	0.4
Severe	0.45	0.4	0.4
Extreme	0.4	0.35	0.35

3.2.15 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:

Minium Grade of Concrete

A. For Bridges in Pre-stressed Concrete and important Bridges.

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

B. For Bridges other than mentioned above and sub-structure.

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

3.2.16 Cementitious material content

Maximum Cementitious Material Content shall be limited to 540kg/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			
	Grade	Content	Grade	Content
Moderate	M-25	300	M-30	360
Severe	M-30	360	M-35	380
Extreme	M-35	380	M-40	440

3.2.17 Clear cover

It is the least distance from outer most surface of steel or binding wire or its end to the face of concrete. It is also an 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
Micropiles	50	50	50

3.2.18 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.

3.2.19 Mixing of concrete:

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.

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.

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.

3.2.20 Transporting, Placing and Compaction of Concrete

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.

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.

All formwork and reinforcement contained in it shall be cleaned and made free from standing water, dust, immediately before placing of concrete.

No concrete shall be placed in any part of the structure until approval of the Engineer has been obtained.

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.

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.

Concrete when deposited shall have a temperature of not less than 5°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.

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. Mechanical vibrators used shall be of appropriate specifications, type and capacity and as directed by the Engineer.

3.2.21 Equipment and machinery for concreting

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.

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.

3.2.22 Transportation of concrete & pumping of concrete

3.2.22.1. 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.

3.2.22.2 Transportation by Mixer Trucks

These are essentially revolving drums mounted on truck chassis. Truck mixers used in the job shall be labelled permanently to indicate the manufacturers 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. Fulfillment 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. 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.

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.

3.2.22.3 Transporting by Agitating / Non-agitating Trucks.

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.

Agitators, if mounted, also aid in the discharging of concrete from the truck in addition to keeping the concrete alive.

Water shall not be added to concrete in transport through this system.

Bodies of trucks shall be provided with protective covers during period of inclement weather. 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.

3.2.22.4 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.

3.2.22.5 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.

3.2.22.6 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.

3.2.22.7 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.

3.2.22.8 Pumpable Concrete (Extracted from §8.9 of Concrete Bridge Code,1997)

General-Pumpable concrete is the concrete which is conveyed by pressure through either rigid pipe or flexible hose and discharged directly into the desired area. It is especially used where space for construction equipment is very limited.

Pumping Rate and Range ' Depending on the equipment, pumping rate should be 10 to 70 cum. per hour. Effective pumping range is upto 300m horizontally and 90m vertically.

i) Proportioning Pumpable Concrete

- a) Basic Consideration - More emphasis on quality control is essential to the proportioning and use of a dependable pump mix. Concrete mixes for pumping must be plastic. Particular attention must be given to the mortar and to the amounts and sizes of coarse aggregates.
- b) The maximum size of angular coarse aggregate is limited to one-third of smallest inside diameter of the hose or pipe. Provisions should be made for elimination of oversized particles in the concrete by finish screening or by careful selection of aggregates.

iii) Pumping Concrete

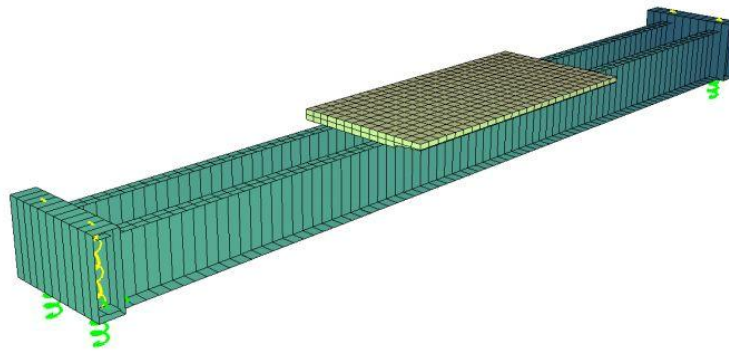
- a) Proper planning of concrete supply, pump locations, line layout, placing sequences and the entire pumping operation will result in saving of cost and time. The pump should be placed as near the placing area as practicable and the entire surrounding area must have adequate bearing strength. Lines 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.

3.2.23 Construction joints

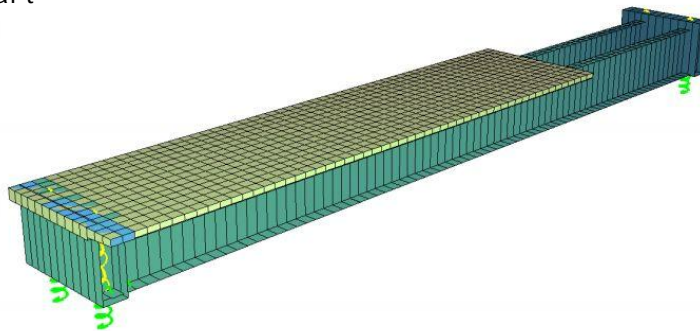
Construction joints shall be avoided as far as possible and in no case the locations of such joints shall be changed or increased from those shown on the drawings, except with express approval of the Bridges 2, 3 and 61 of D-Q Section /USBRL Project TECHNICAL SPECIFICATIONS Engineer. The joints shall 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.

The construction stages for concreting of the deck slab are divided into three parts (informative):

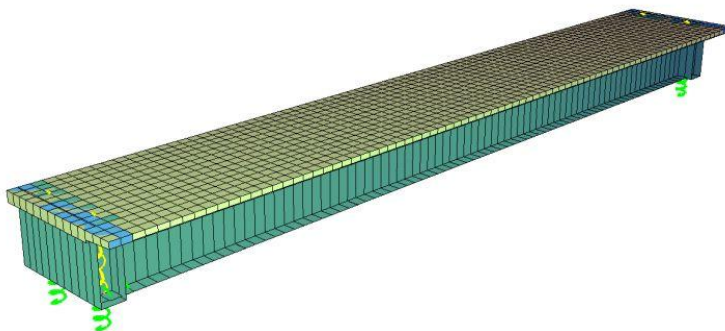
1. Central part



2. First outer part



3. Second outer part



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.

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.

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 cutback to expose the bars for a length of about 50 mm to ensure that contaminated concrete is removed.

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.

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.

3.2.24 finishing for 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 rejected specified in these conditions, are liable to be rejected and the decision of the Engineer shall be in regard.

3.2.25 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).

3.2.26 Shuttering, Formwork & False work

Shuttering, Formwork & False work shall be designed by the Contractor to meet the requirements of the permanent structure, taking into account the actual conditions of materials, environment and site conditions. Careful attention shall be paid to the detailing of connections and functions. All the materials used for shuttering, formwork & false work shall conform to the specified quality consistent with the intended purpose and actual site condition as applicable. All shuttering, formwork, false work, etc., shall be got approved by the Engineer before it is put into use.

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	7 days
2) Spanning over 4.5 m	14 days
e) Removal of props under beams	
1) Spanning up to 6 m	14 days
2) Spanning over 6 m	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.

3.2.26.1 Design for formwork for Concrete Slab

The Contractor shall submit a design proposal for the formwork, shuttering and falsework on the lower side of the concrete slab, between the steel girder for approval by the Engineer as part of his methodology.

3.2.27 Defective Concrete and Measurement of concrete

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. EMPLOYER 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.

However, some surface defects, not affecting the structural properties shall, on the instruction of the Engineer, be repaired as per the approved procedures. The complete cost of such repairs shall be borne by the contractor and no compensation shall be payable. Records of such repairs done shall be maintained by the contractor.

Tolerances for Finished Concrete Bridge Structure

Sr. 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	+/- 5 mm
12	Centre to centre distance of pier and abutments at pier top	+/- 30 mm
13	Centre to centre distance of bearings along soan	+/- 5 mm
14	Centre to centre distance of pier bearings across span	+/- 5 mm

The tolerance for finished concrete bridge structures shall be governed by IRS Concrete Bridge C be followed; deviations beyond the permissible limits shown are liable to be rejected. These tolera other structures also appropriately.

3.2.28 Sampling and Strength Testing of Concrete:

3.2.28.1 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.

3.2.28.2 Sampling .

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,(M3)	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 mc or part thereof

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.

3.2.29 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.

3.2.30 Acceptance Criteria of Concrete

Acceptance criteria for RUIDP SOR items shall be as per MOST/MoRT&H specifications and NS items based on USSR 2010 of NWR shall be as per acceptance of concrete as per Clause No 16 of Annexure 4.2 of Indian Railway Unified Standard Specifications (Works & Materials), Volume I, 2010. Also refer criteria of concrete vide clause no 20.3.11.5 of Indian Railway Unified specifications. The 28 days compressive strength shall be the criterion for acceptance or rejection of the concrete. The followings shall also be strictly followed.

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.

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.

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.

3.2.31 Setting of field laboratory by the Contractor

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 EMPLOYER 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.

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.

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.

All the equipments, machinery etc., shall be kept in good working condition. Contractor shall also maintain the required qualified / experienced staff at the laboratory.

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).

As frequently as the Engineer may require, testing shall be carried out in the field for:

- (a) Moisture content and absorption and density of sand and aggregate.
- (b) Silt content of sand
- (c) Grading of sand and aggregates.
- (d) Slump test of concrete.
- (e) Concrete cube test.
- (f) Permeability test for concrete
- (g) Density of Plasticizer.
- (h) PH Value of water

3.2.32 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.

3.2.33 Expansion joints

Expansion joints 'strip seal elastomeric type expansion joint shall be for 80mm expansion gap in RCC deck slab as per drawings.

3.2.34 Drainage outlets

150mm pipes will serve as drainage spouts. The type and material of the drainage spouts shall be in accordance with the relevant drawing provided by the Employer / Designer.

3.3 General gridlines and specifications for supply of reinforcement and structural steel

3.3.1 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 EMPLOYER 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.

3.4.2 Specifications for steel

The steel supplied by the contractor must satisfy any of the following material specifications as required for the work along with other concerned specifications.

For RCC : Thermo mechanical Treated bars of grade Fe 500

Structural steel for decks and upper part of the tower: E350C (ex FE 490B) conforming to IS 8500

Structural steel for pipes of micropiles and antivandalism protection of the stays ; E250BR (ex FE 410) conforming to IS 2062

Threadbars Yield Strength/Tensile Strength f_{02k}/f_{tk} (N/mm²) 670/800 conforming to BS 4449 : 1997

Threadbars Yield Strength/Tensile Strength f_{02k}/f_{tk} (N/mm²) 950/1050 conforming to EN 10138-4

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

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.

The Contractor shall arrange to carryout additional tests on physical properties of steel for every 50 metric tonne (t) of steel and for every change in lot / batch for reinforcement steel and structural steel at his cost. No extra payment will be made for conducting such tests and the agreemental rate is inclusive of above testing charges.

3.4.3 Procurement of steel

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.

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.

3.4.4 Reinforcement and structural steel

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.

3.4.5 Stage payments for structural steel

No Advance Payment shall be made. However, stage payment for manufacturer of steel girders shall be made as per Bills of Quantities by the EMPLOYER for steel physically brought to site by the contractor, before actual use in the work against irrevocable Bank Guarantee or Indemnity Bond (as the case may be) and on production of necessary records.

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) The payment will be restricted to schedule of bill of quantity.

Proper account in the Steel Register is to be maintained in the prescribed format at the site for the receipt and use of the steel.

Ownership of such steel shall be deemed to vest with the EMPLOYER.

Before releasing the stage payment, the contractor shall insure the steel at his own cost in favour of EMPLOYER against theft, misuse, damages, fire etc., and submit the insurance along with Indemnity bond / Bank Guarantee covering the Stage amount for steel.

The price variation claim for steel will continue to be governed as per extant PV clause and with reference to delivery at site.

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.

No Stage payment is permitted for steel required for temporary and enabling works.

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.

3.4.6 Others

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.

Steel material, for which stage payment has been availed by the Contractor, shall be property of EMPLOYER 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.

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 EMPLOYER and insurance etc., have been arranged by the contractor.

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

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.

3.5 General guidelines and specifications for fabrication & erection of composite structure

3.5.1 General

This chapter covers the supply of material, fabrication, assembly and erection of Composite Girder.

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 IRUSS (W&M), 2010 and Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001).

The protective coating is to be given to the composite girder by metallizing with sprayed aluminium as recommended in design drawings.

The Contractor will be required to develop jigs & Masters for each components of composite Girder and same will be approved by EMPLOYER 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.

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 EMPLOYER to the Contractor.

3.5.2 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 equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of locating their store yard, laboratory, staff quarters etc., and satisfy themselves with regard to the feasibility of transporting the plate girders from the yard to the final site of placement etc.

3.5.2.1 Transport and Working Environment

3.5.2.1.1 Access Road

General

Bidders are required to inspect the general access to the project area as well as the Sumberand Tutsunnallah, Indsite access road.

3.5.2.1.2 Transport Vehicle

For bridge no. 2 & 3, 39.0m steel girders for each span are divided into 3 nos. 13.0m pieces and for bridge no. 61, 30.5m steel girder for each span are divided into 4 nos. 8m to 8.5m shall be permitted for manufacturing and transport.

For transport of the 13.0m and 8.5m long steel girders parts, a purpose-made vehicle is to be deployed by the Contractor in order to cope with the access situation.

3.5.2.1.3 Access conditions due to weather

The access to the project area / site is significantly hampered during the rainy season; The Contractor shall have a certain supply of equipment and materials on site, and (because of the nature of the project and its location), just-in-time delivery should be avoided. Disruption to the road as verified by the Engineer for up to (e.g.) 5 days shall not be considered grounds for time extension.

3.5.2.2 Situation at Sumer Yard and TutsunNallah location

Tenderers are required 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.

3.5.2.2.1 Access to bridge locations

For access to each bridge locations, the Contractor may construct access roads and all related support structures to his requirements from main access road. The design of the access road shall be submitted to the Engineer for approval. The design shall include as a minimum:

- o Layout and (typical) cross sections
- o Longitudinal section
- o Proposed slope support measures including calculations, if any

Unless otherwise instructed by the Engineer, after erection of the bridge superstructure, the road shall be dismantled and re-cultivation works shall

3.5.3 Brief design data

The composite girders has been designed as per relevant IRS / IRC codes.

3.5.4 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).

3.5.4.1 Indian Railway Standard Codes and Specifications

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 4 (upto date).

IRS : Welded Bridge Code (1989)

IRS : Steel Bridge Code (2003)

IRS: M-28 Specifications for electrodes.

IRS: M-39 Specification for wire flux for SAW.

3.5.4.2 INDIAN STANDARD SPECIFICATION

IS: 2062-2011 Specification for structural steel.

IS: 813-1986 Scheme of symbols for welding.

IS: 800-2007.

IS: 9595-1996 Manual for metal arc welding.

IS: 818-1968 Code of Practice for safety and Health requirements in electric and gas welding operations.

IS: 5666-1970 Etch (Pre-treatment) Primer

IS: 104-1979 Specification for Ready mixed paint, brushing, zinc chrome, Priming

IS : 2339-1963 : Aluminium paint

IS: 2004-1991 Carbon steel forgings for general Engineering purposes.

IS: 1852-1985 Rolling and cutting tolerances for hot-rolled steel products.

IS: 1148-2009 Rivet bars for structural purposes.

IS: 4353-1995 Recommendations of Sub-merged Arc welding of mild steel and low alloy steel.

(xiii) IS: 3935-1966 (shear connector)

3.5.5 Materials

Steel (Plates and Rolled sections) should conform to IS: 2062-2011. It shall have Sub quality 'C' & Grade E350 (ex Fe 490 B) as mentioned in the tender schedule and the requirements of IRS B1-2001 shall be fulfilled for all components. Plates are fully killed and fully normalized / controlled cooled as mentioned in the tender schedule. C sub quality indicate the requirement of impact test at room temperature and should conform to Charpy Impact Test at room temperature in accordance with relevant I.S. Code.

Material supplied by the manufacturers shall be ultrasonically tested as per codal provisions at the manufacturer's premises before dispatch. The contractor on receipt of supply in his factory premises/fabrication workshop may have to carry out random USFD testing as per standards laid down in various codes and verify them with the list received from manufacturers, if instructed by the inspection agency/ Site Engineer.

Only tested steel shall be used for fabrication. The steel shall comply in all respects with the requirements of approved drawings and relevant codes and specifications and it may be noted that quality of steel used for fabrication shall be the essence of the contract & shall be rigidly followed.

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.

3.5.5.1 Thicknesses of Girder Elements

Stacking / layering and welding of steel plates to achieve the thicknesses of the flanges and the web of the steel girders is not permitted.

3.5.6 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 up to 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 materials 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.

3.5.7 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.

3.5.8 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.

3.5.9 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. The whole of work to be erected complete and pieces marked to place.

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.

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.

HSFG bolts shall be provided as per design drawing.

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 EMPLOYER.

All welding consumables (electrodes, wire, flux etc.) shall be procured only from the manufacturers approved by Engineer.

3.5.10 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.

3.5.11 Fabrication

3.5.11.1 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 CPM, EMPLOYER. 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.

3.5.11.2 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 CPM, EMPLOYER. 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.

3.5.11.3 Maintenance of records by Fabricators

The records of fabrication shall be maintained in the registers such as Jigs register, HSFG bolt checking register, Material offering and inspection register, 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.

3.5.11.4 Tolerance in Fabrication

Basically, composite girders are plate 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.

3.5.12 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 recognized institutions competent to do so.

3.5.13 Flattening and Straightening

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.

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

3.5.14 Planning and Shearing

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.

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

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.

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.

Flame Cutting

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.

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

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.

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.

3.5.15 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 EMPLOYER. Only approved and stamped jigs shall be used for fabrication.

3.5.15.1 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,

Tack welds shall be not less than the throat thickness or leg length of the root run to be used in the joint.

Length of the tack weld shall not be less than four times the thickness of the thicker part or 50mm whichever is the smaller.

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.

Tack welds shall not be made at extreme ends of joints.

Tack welds are equally important in the overall quality and performance of the girder and these shall also be made by qualified welders.

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.

3.5.16 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.

3.5.17 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.

3.5.18 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.

3.5.19 Temporary bolts, nuts & washers:

Refer Cl.28.1 to Cl.28.8 of IR Fabrication specification Serial No. IRS-B1-2001 issued by RDSO.

3.5.20 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 EMPLOYER 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.

3.5.21 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 Engineer-in-Charge. 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.

3.5.22 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.

3.2.23 Sequence of welding and welding pass

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.

3.2.24 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.

The samples of material shall be selected and marked by the ENGINEER when the materials for the work are inspected at the mills.

The trials of flame cutting shall be carried out in material representative of all thicknesses to be used in the work.

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.

The trials shall include specimen weld details from the actual construction which shall be welded in a manner simulating the most unfavorable 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.

Procedure trials: Testing shall be to relevant IS code or if approved to BS 709. The following groups of tests shall be carried out with the type of welds.

(a) Butt welds: Transverse tensile test, transverse & longitudinal bend test with the root of weld in tension and compression respectively, charpy V-notch impact test.

(b) Fillet welds: Fillet weld fracture test.

(c) Track welds: Inspection for cracking.

(d) All welds: Macro examination.

Additional tests may also be carried out as per requirement and instruction of Engineer, the cost of which shall be borne by the contractor.

Shop welded joints will be radiographically examined for 100 %.

Following tests are normally performed on welds.

(a) Non Destructive Tests (NDT):

- Visual inspection/profile gauge for dimensional check of size and throat thickness of weld.
- Etching test for penetration of joint.

- Magnetic particle or Ultra Sonic Pulse Velocity (USPV)
- Gamma Radiography & x-ray (only for butt welds)
- Dye penetration of all 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.

3.5.25 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.

3.5.26 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.

3.5.27 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 EMPLOYER.

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.

3.5.28 Additional Precautions during Welding

Following precautions shall further be observed during fabrication.

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.

Covered shed for environmental control (particularly against dust, moisture and water) shall be provided to avoid entrapment of hydrogen which is likely to cause crack initiation in weld or under bed of weld (i.e. Heat Affected Zone HAZ). Also baking of flux use for submerged arc welding in oven for an hour at 200 degree C shall be carried out o ensure that no moisture is contained in flux during welding.

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.

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.

Stray arcing of components, which cause local hard spots or cracking of parent metal, shall be avoided.

Flux of approved quality will be permitted for use.

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.

Pre Heat Treatment will be given to the consumables to remove the moisture if any.

No violation of welding procedure will be permitted on any account.

3.5.29 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.

Pneumatic grinding machine, drilling machines, chipping machines and wrenches etc.

Sand blasting equipment and metalizing equipments.

Welding machines.

- (a). SAW
- (b). MIG/MAG

Welding transformers³⁺

Cranes of adequate capacity.

Suitable Jigs and fixtures.

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.

Suitable Welding manipulator.

Macro etching/DP or MP testing facilities.

Tongue tester for measuring current and voltage.

Gauges for checking weld size throat thickness and edge preparation etc..

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.

3.5.30 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.

3.5.31 Stud shear connector

3.5.31.1 Material

The stud shear connector and ceramic ferrules shall conform to type SD1/UF as per BS EN ISO 13918-2008. The diameter of ceramic ferrule D 7 as per Figure 13/Table 18 of BS EN ISO 13918 shall be 26. Mechanical properties of stud shear connectors shall be as per ISO 6892/BS EN ISO 13918'2008. Shape of tip of stud shear connectors may be chosen by manufacturer. The stud tip shall be supplied with flux in the form of press fitted aluminium ball or Aluminium spray coating

3.5.31.2 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

3.5.31.3 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 (BS 5400-6).

3.5.31.4 Measurements

The work shall be enumerated. It's unit is each.

3.5.31.5 Rates

The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above.

3.5.32 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).

Prior to the application of protective coating , the surface of work shall be carefully prepared removing mill-scale, rust, etc. using wire brushes, sand or grit blasting as stipulated and approved by the Purchaser.

The protective coating by metallising with sprayed aluminium as given in the 0, followed by painting as per painting schedule given below may be applied:

One coat of etch primer to IS:5666.

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.

Two coats of aluminium paint to IS:2339 brushing or spraying as required. One coat shall be applied before the fabricated steel work leaves the shop. After the steel work is erected at site, the second finishing coat shall be applied after touching up the primer and the finishing coat if damaged in transit.

Surfaces which are inaccessible for cleaning and painting after fabrication shall be applied one heavy coat of zinc chrome red oxide priming to IS:2074 before being assembled for rivetting/welding.

All rivets, bolts, nuts, washers etc. are to be thoroughly cleaned and dipped into boiled linseed oil to IS:77

All machined surfaces are to be well coated with a mixture of white lead to IS:34 and Mutton tallow to IS:887.

For site painting the whole of the steel work shall be given the second finishing coat after finally passing and after touching up the primer and finishing coats if damaged in transit.

No part of the work shall be painted or coated, packed or dispatched, until it has been finally inspected and approved by the Inspecting Officer. Dry Film Thickness shall be measured by elcometer or any other approved method.

3.5.32.1 General Instructions for Corrosions protection and friction values of butt strap joint contact areas

The following corrosion protection scheme shall be followed for the bridges 2 and 3

- Corrosion protection of the girder, except contact areas for the butt strap joint shall be done in full in the shop.
- In the area of the contact areas for the butt strap joint of the 13.0m girders, only primer coating shall be carried out in the shop.
- In these areas, the absolute minimum friction coefficient shall be $\mu = 0.3$
- Full corrosion protection for the areas of the butt strap joint shall be done on site after connection of the girders.

3.5.32.2 Metallising with Sprayed Aluminium

3.5.32.2.1 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 and all members in plate & composite girders shall be metalized as IRS specifications.

3.5.32.2.2 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.

3.5.32.2.2.1 Purity of Aluminium

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

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.

3.5.32.2.2.2 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 below, shall be not less than 110 μ (microns).

3.5.32.2.2.3 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.

3.5.32.2.2.4 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

3.5.32.2.2.5 Method for the Determination of Local Thickness

3.5.32.2.2.5.1 Equipment

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

3.5.32.2.2.5.2 Calibration of Instrument

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

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 0

3.5.32.2.5.3 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.

3.5.32.2.6 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.

3.5.32.2.7 Inspection

3.5.32.2.8 Determination of Local Thickness

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

3.5.32.2.8.1 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.

3.5.33 Paints: source & quality

Paint and other accessories including those for metallising work will be supplied by the contractor.

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.

3.5.34 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.

3.5.35 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.

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.

3.5.36 Assembly & erection

3.5.36.1 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.

3.5.36.2 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 EMPLOYER 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.

3.5.37 Care during Assembly at Workshop**3.5.37.1 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.

3.5.37.2 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.

3.5.38 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 & labeled; 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. The length of the steel girders shall be 13.0m for Br. No 2 & 3 and 8m to 8.5m for Bridge no. 61. The further partition or reduction of this length shall not be permitted.

3.5.39 Assembly at site**3.5.39.1 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.

3.5.39.2 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.

3.5.39.3 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.

3.5.39.3.1 Reaming

No reaming shall be undertaken without the written authority of Engineer or his authorized representative except for under drilled holes meant for turned bolts. The contractor shall supply special bolts to fill reamed hole, where reaming is approved. Record of all such variations shall be kept. However, these provisions should not apply for under drilled holes meant for turned bolts. Copies of all correspondence pertaining to the recourse of reaming and the use of oversize bolts shall be sent by the contractor for information to Engineer.

3.5.39.3.2 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.

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.

3.5.39.4 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 0.

3.5.40 Assembly and Launching

3.5.40.1 Design of Launching Method

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 EMPLOYER. 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.

3.5.41 Field Bolts, Nuts and Service Accessories

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.

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.

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).

3.5.42 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.

3.5.43 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.

3.5.44 Erection & equipment

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.

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.

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.

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.

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 up to the capacity for which they are required.

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

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.

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.

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

3.5.45 Additional special conditions:

3.5.45.1 Land

EMPLOYER 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.

3.5.45.2 Further Drawing and Instructions

EMPLOYER 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 EMPLOYER have given an extra order for the same in writing.

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.

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.

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.

3.5.45.3 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.

3.5.45.4 Contractor to Study Drawing & Specification etc. and his Liability

The contractor shall be responsible for close scrutiny of the approved drawings supplied by the EMPLOYER, For any discrepancies, error or omission in the drawings or other particulars indicated therein, the contractor shall approach the EMPLOYER immediately for rectification of indicated therein, the contractor shall approach the EMPLOYER 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.

3.5.45.5 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 EMPLOYER officials.

3.5.45.6 Any Doubted Points to be referred to the EMPLOYER

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 EMPLOYER. Only such reply as the said EMPLOYER may be in writing given shall be taken as the authoritative interpretation of the point in doubt or obscurity.

3.5.45.7 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.

EMPLOYER 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.

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.

3.5.45.8 Site Facilities by the Contractor

Contractor shall provide office(one container 20'x10' with 2 office table and revolving chair,6 visitor chair, ,almirah , ,toilet and necessary sewerage water supply at each bridge site) / 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.

Contractor shall supply round the clock electricity in site offices of EMPLOYER 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.

To provide proper communication the contractor shall (at his own cost) establish inter office communication system between EMPLOYER 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.

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.

3.5.45.9 Declaration of designed fabrication/assembly yard as a part of site

EMPLOYER 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.

3.5.46 Method of measurement for payment

3.5.46.1 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/botls/welds etc shall be made.

The drawing office dispatch lists (D.O.D.Ls) when prepared according to procedure shall be submitted by the contractor to the Engineer for approval.

The payment for steel work as per item in the schedule of items shall be released in stages of accepted item rates for quantities executed, as mentioned in the tender schedule. The payment after receipt of material in fabrication shop shall be made on the basis of measurements contained in the supplier's vouchers, if required, these measurements shall be further verified by the representative of Engineer in charge by measuring dimensions/sizes of the sections and multiplying the same by standard weight. Sampling for actual weight of the sections shall also be done by him as per procedure and frequency prescribed by Engineer.

The payment for complete metallizing / painting of all components of girders including all accessories, painting of contact surface etc including all labour and material, tools and plants, machinery required for all operations of work is included in the accepted rates of item in the schedule. Nothing extra shall be paid.

In the event of a dispute arising as to a portion of steel work, weightment shall be made in the presence of the Engineer.

No separate payment shall be made for the field bolts, nuts (HSFG etc.) 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.

3.5.47 BEARING

Appropriate structural POT PTFE-Stainless Steel Bearings shall be provided over piers and **abutments; designed shall be as per BS-EUROCODES.**

3.5.48 Deflection test

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

3.6 Bearings (POT/PTFE)

This work shall consist of furnishing and fixing bearings in position in accordance with the details shown on the drawings, to the requirements of these specifications or as directed by the Engineer.

3.6.1 General

- (i) Bearing plates, bars, rockers, assemblies and other expansion or fixed devices shall be constructed in accordance with the details shown on the drawings.
- (ii) All bearing shall be capable of being replaced during the lifetime of the structure and shall be robust, durable and proven type obtained from the approved manufacturers, who can provide complete facilities for raw materials and finished products.
- (iii) All bearings of the same type at any one structure shall be obtained from the same manufacturer. The drawings show acceptable bearings but the Contractor shall be free to propose the use of alternative bearings with properties equal to or better than those shown on the drawings subject to the Engineer's approval.
- (iv) All bearings shall be designed and installed according to EN 1337. The detailed design (structural design of bearings shop drawings etc.) of the bearings shall be done by the Contractor respectively the manufacturer of the bearings.
- (v) The Contractor shall inform the Engineer at least 14 days in advance of the date of manufacture of the bearings and of the date when tests are to be carried out.
- (vi) Bearings shall not be dispatched to the site until the tests described in the Contract have been satisfactorily completed and the certified results of such tests approved by the Engineer.
- (vii) Bearings of a proprietary design and manufacture shall be installed strictly in accordance with the manufacturer's instructions
- (viii) The installation of the bearings shall be as directed by the Engineer. Bearings shall be maintained in their correct position during placing of the bridge steel girders / transversal beam.
- (ix) The Contractor shall exercise the utmost care in setting and fixing all bearings in their correct positions and ensuring that uniformity is obtained on all bearing surfaces,
- (x) Bearings shall be handled with care and stored under cover.
- (xi) When bearing assemblies or plates are shown on the drawings to be placed (not embedded) directly on concrete, the concrete bearing area shall be constructed slightly above grade (not exceeding 12 mm) and shall be finished by grinding.
- (xii) It shall be ensured that the bearings are set truly level and in exact position as indicated on the drawings so as to have full and even bearing on the seats. Thin mortar pads (not exceeding 12 mm) may even be made w meet with this requirement.
- (xiii) It shall be ensured that the bottoms of girders to be received on the bearings are plane at the locations of these bearings and care shall be taken that the bearings are not displaced while placing the girders.
- (xiv) The anchor bolts, if shown on the Drawing, shall be installed to permit true positioning of the bearing assemblies. The drilled holes for fixing the bolts shall be completely filled with mortar consisting of 1 part of cement: 2 part of sand.

3.6.2 POT bearing

A bearing consisting of a metal piston supported by a disc of unreinforced elastomer that is confined within a metal cylinder for allowing rotational movement about any axis in horizontal plane and to bear and transmit vertical load. Pot bearings may be provided with sliding assembly (with or without restraint in the form of guide along a desired direction to bear and transmit horizontal force) comprising of stainless steel plate attached to metal backing plate sliding in horizontal plane over PTFE confined in recess(s) on the piston which shall be termed as Pot-cum-PTFE bearings.

Types of POT Bearing:

- ❖ Fixed type
- ❖ Transverse fixed
- ❖ Longitudinal fixed
- ❖ Free

In the following clauses, general specifications are provided. Detailed specifications shall be according to IRC:83 and BS EN 1337

3.6.2.1 Pot Bearings moveable

3.6.2.1.1 Design

The bearings must be designed in line with EN 1337 Part 5 – Pot Bearings. All pieces exposed to tear and wear must be exchangeable.

3.9.2.1.2 Testing

Testing must be carried out as specified in EN 1337.

3.6.2.1.3 Installation

The bearings must be installed with a horizontal tolerance of +/- 5 mm and a vertical tolerance of +/-2 mm.

3.6.2.1.4 Epoxy Mortar for Bedding

Epoxy mortar for bedding bearings shall be epoxy mortar approved by the Engineer. The epoxy grout shall be stored, mixed, placed and cured in accordance with the manufacturer's recommendations.

3.6.2.2 Fixed Bearings

3.6.2.2.1 General :

Fixed bearings have to be constructed in that way that:

- ❖ they can take horizontal loads (including earthquake loads);
- ❖ vertical movements are possible;
- ❖ movements are allowed in only one or no direction;
- ❖ inclinations are possible;
- ❖ they have a durability according to their purpose

3.6.2.2.2 Design

The bearings must be designed in line with EN 1337 Part 8: Guide Bearings and Restraint Bearings. All parts exposed to tear and wear must be exchangeable.

3.6.2.2.3 Testing

Testing must be carried out as specified in EN 1337.

3.6.2.2.4 Installation

The bearings must be installed with a horizontal tolerance of +/- 5 mm and a vertical tolerance of +/-2 mm.

3.6.2.2.5 Epoxy Mortar for Bedding

Epoxy mortar for bedding bearings shall be epoxy mortar approved by the Engineer. The epoxy grout shall be stored, mixed, placed and cured in accordance with the manufacturer's recommendations.

3.6.2.3 Materials

All materials, particularly the following, shall be original, unused or non-re-cycled conforming to relevant specifications:

- ❖ Structural steel shall conform to IS:2062 as applicable
- ❖ Cast steel shall conform to Gr 280-520W of IS 0.3 to 0.5 percent copper may be added to increase the corrosion resistance properties.
- ❖ Stainless steel shall conform to AISI:304 or X04Cr 18Ni10 of IS:6911 for ordinary applications. For applications with adverse/corrosive environment, the stainless steel conform to AISI; 316L or O2Cr17Ni12Mo2 of IS:6911.
- ❖ PTFE (poly tetra fluoro ethylene) shall be of unfilled pure virgin quality. It shall be free sintered. The mechanical properties of unfilled PTFE shall comply with Grade A of BS:3784 and thickness shall be as specified.
- ❖ Anchor Bolts shall be as per relevant IS specifications.

3.6.2.2 Workmanship

(i) Welding

All welding shall conform to IS:9595 with electrodes of suitable grade as per IS:814. Preheating and post weld stress relieving shall be done as per IS:9595.

(ii) Cast Steel Assemblies

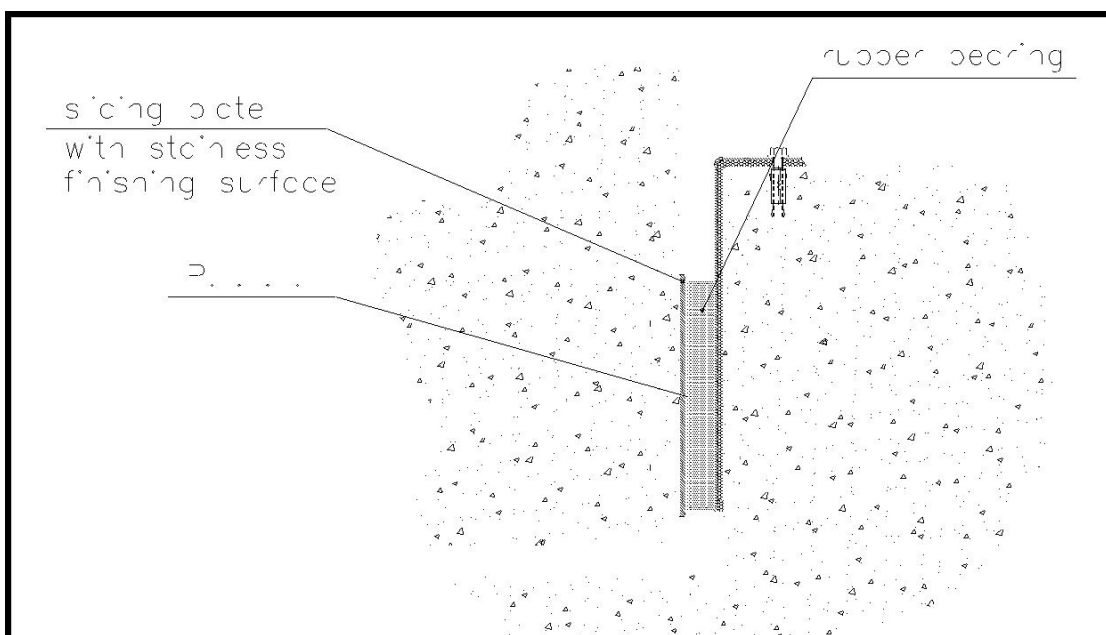
Cast steel for pot-bearing assemblies shall conform to requirements of relevant IS. Casting shall be true to the forms and dimensions shown on the Drawings, and shall be free from pouring faults, sponginess, cracks, blow holes and other defects affecting their appearance or their strength, Warped or distorted casting shall not be accepted. Exposed surface shall be smooth and dense.

All irregularities, fins or risers shall be ground off flush with the adjacent surface. Castings with visible cracks, blow holes or similar blemishes shall be rejected if the imperfections are located on bearing surfaces or cannot be remedied to the satisfaction of the Engineer.

Imperfections, which are not located on, bearing surfaces shall be cleaned out filled with weld metal of the appropriate composition and ground flush with adjacent surfaces.

(iii) Structural Steel Assemblies

Defects arising from the fabrication of the steel shall be inspected by the Engineer, who shall decide whether the materials may be repaired by the Contractor or will be rejected. The cost of repairs or replacement shall be borne by the Contractor. All plates shall be flat and rolled bars. Straightening shall be done by methods, which shall not damage the material. Sharp kinks and bends shall be the cause for rejection. Steel may be flame cut to shape and length so that a regular surface, free from excessive gouges and striations is obtained. Flame cutting by hand shall be done only with the approval of the Engineer. Exposed corners shall be machined or ground.



3.6.2.4 Painting

All non-working surfaces shall be coated with two coats of epoxy primer and one or more coat each of epoxy intermediate and finish, total thickness < 0.150 mm or any other painting scheme as approved by the Engineer.

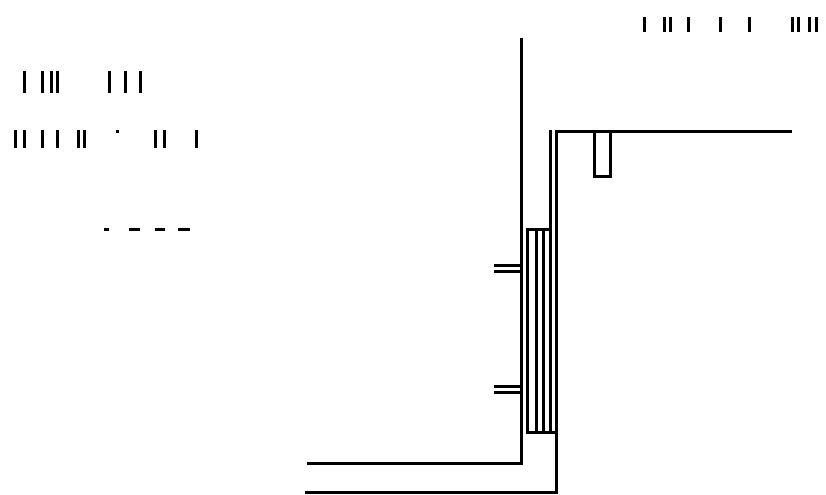
Silicon grease shall be applied at the PTFE/SS interface after testing.

Anchor sleeves shall be cement coated at the manufacturer works.

3.6.3 Transversal deck stopper devices

3.6.3.1 General

This Part covers the design, testing, provision and installation of replaceable bridge transversal stoppers as shown on the drawings, as specified herein or as required to complete the Work. If the below is unreadable, please see IRCON's e-tender no. IRCON/J&K CELL/JAT/14/1014/K-B/Br.2,3 & 61/362, published in January - 2017 which is readily available in internet or may see at our office during the working days.



As showed in the above figure, the transversal stopper is obtained by an ordinary multidirectional free sliding rubber bearing that shall be set up vertically:

The sliding part is a steel plate with stainless finishing surface and shall be linked by means of specific connection to both deck and shear key; said connection shall permit substitution of the device if needed;

The fixed part, connected to the pier, is a rubber pad with steel layers reinforcement and a finishing P.T.F.E layer patched on the rubber by means of a vulcanizing process that will allow sliding.

As above described, the transversal stopper is actually an ordinary bearing device and in the following sections it shall be referred to as bearing device or bearing.

3.6.3.2 References

The transversal stopper, as per an ordinary bearing, shall comply with the requirements of AASHTO section I-14 and II-18, as overruled by the requirements of this Section.

3.6.3.3 Definitions

Definitions of bearing device components shall be in accordance with AASHTO Section I-14.2.

3.6.3.4 Submittals

(i) Bearing Manufacturer: Submit the name of the proposed bearing Manufacturer with reference of work of a similar nature carried out by him on other projects, with relevant dates.

The submittal shall also include the name of the proposed bearing manufacturer whose products have proven to be highly satisfactory in similar environmental conditions to those experienced in the Region of the construction. In this respect the submittal shall include a list of works, executed in similar conditions, in which the same bearings were successfully used.

(ii) Product Data: Submit manufacturer's product data including details of the proposed bearings and method of installation, as well as manufacturer's material specifications for all materials including bedding materials immediately under and above the bearings. Include sample test reports to show compliance with the specifications.

(iii) Design Calculations: Submit detailed design calculations in support of the sizes and quality of each component of the bearing. Include allowable stresses/loads for all materials and components as well as a listing of all formulas and equations used.

- (iv) Shop Drawings: Submit shop drawings with a part list showing material specifications and dimensions of each component of the bearing as well as the corrosion protection system specification and thicknesses.
- (v) Method Statement: Submit a method statement including the method of handling, transportation, storage and installation. It shall also include the procedures for devices replacement.
- (vi) Testing Program: Submit a program for testing of bearings as specified herein.
- (vii) Test Certificates: Submit test certificates for all materials to show compliance with the specifications.
- (viii) Testing Report: Submit a comprehensive report on the testing of bearings prepared by an independent testing body/laboratory. The report shall include photographs and descriptions of the test rigs, instrumentation and all factual data with a comparison of test results and the requirements of the specification, as well as conclusions.
- (ix) Maintenance Manual.

3.6.3.5 Design and Performance Requirements

- A. Design bearings in accordance with AASHTO: Section I-14 with the additional analyses required herein.
- B. The average bearing stress at booth pier and deck sides of the bearing shall be consistent with the design resistance of the concrete. A check shall also be carried out for the maximum bearing stress at the bearing edge.
- C. Both, fixed part and sliding plate shall be attached to the structure by mechanical fixings or other approved methods.
- D. The fixing arrangement of all bearings shall be such as to enable the bearings to be replaced without the need for cutting into the bridge and damaging the superstructure or substructure.

3.6.3.6 Guarantee

The bearings shall be guaranteed for 20 years and the Contractor shall provide the guarantee from the bearing manufacturer.

3.6.3.7 Materials

- A. Materials used in bridge bearings shall comply with AASHTO Section II-18.4.
- B. All fixings shall be in stainless steel conforming to AASHTO.
- C. Unless otherwise described in the Contract, the surface preparation and corrosion protection of bearing shall comply with AASHTO: Section II-18.4 and II-18.6 requirement for more than 20 years of maintenance free period in the environment of the project site in Region of construction.

3.6.3.8 Execution

3.6.3.8.1 Manufacturer

- A. The manufacturing tolerances shall be as specified in AASHTO Section II-18.5.
- B. The longitudinal movements listed for bearings may require bearing presetting with respect to the sliding plate; such preset shall be marked on each bearing by the manufacturer before shipment to site.

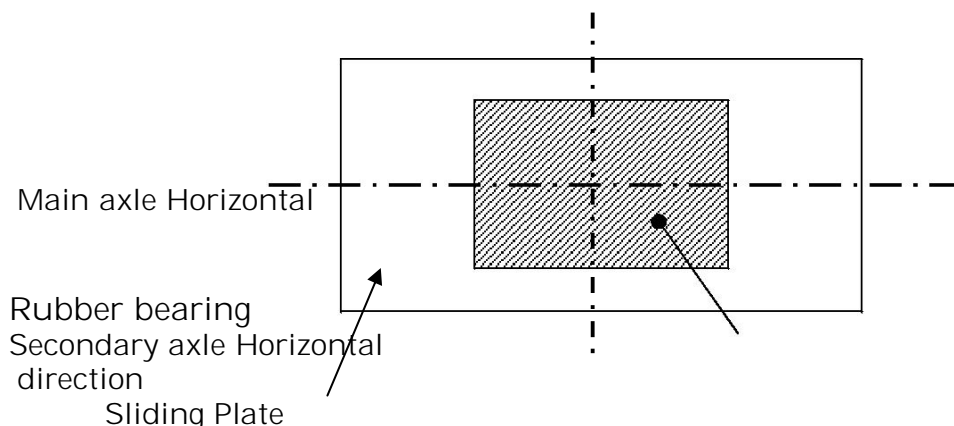
3.6.3.8.2 Transportation and Handling

- A. Bearings shall not be dismantled. Any transit bolts, straps or other temporary fixing shall not be removed until the bearing is fixed in its final position and the structure is in place, unless otherwise marked on the drawings or directed by the Engineer. Care shall be taken to ensure that all transit bolts, straps or other temporary fixings are finally removed.

B. Bearings which incorporate low friction material, such as PTFE, shall not be opened up to expose the surface of the low friction material. Should this happen accidentally, bearing surfaces are to be cleaned and re-greased and assembled as required by the manufacturer and to the satisfaction of the Engineer.

3.6.3.8.3 Installation

1. Bearing installation shall be carried out by trained personnel under the supervision of the bearing manufacturer. Installation shall be in accordance with the manufacturer's instructions and as directed by the Engineer.
2. All bearings shall be set with the main axle (longitudinal sliding direction) placed horizontally and the secondary axle placed vertically, see figure:



3. Both, first installation and replacement procedures of the devices shall be produced by the Contractor and submitted to the Engineer for approval.
4. Any devices such as steel packs used to hold bearings position while being fixed, must be removed finally so that the bearing seats only on its dry pack mortar bedding.
5. Mating surfaces of bearings shall be kept free from contamination and, after the structure has been completed, each bearing and the area around it shall be left clean and tidy, to the satisfaction of the Engineer.

3.6.3.9 Testing

3.6.3.9.1 General

All testing, including load testing of prototype bearings, shall be carried out at an independent laboratory approved by the Engineer and will form the basis for approval of bearings.

The Engineer or his nominated representative may attend one or all of the tests. The Contractor shall arrange the dates and times of tests to enable the Engineer or his representative to attend the tests. If the Engineer or his representative cannot attend the test, the Contractor shall, at his own cost, arrange for an independent observer approved by the Engineer, to witness the test.

3.6.3.9.2 Material Tests

- ❖ The physical and mechanical requirements of all metal components shall be tested for compliance with AASHTO Section II-18.7.
- ❖ PTFE shall be tested for tensile strength and elongation in accordance with the standards specified in AASHTO Section II-18.7.4
- ❖ The physical and mechanical properties of used rubber shall be tested for compliance with AASHTO Section II-18.7.4.
- ❖ The Engineer may, if sufficient and reliable production test certificates exist, waive the requirement for independent tests. The Engineer may reinstitute the requirement for independent testing at any time if he is not satisfied for any reason whatsoever.

3.6.3.9.3 Load Testing

•**Load Test:** the transversal deck stopper device shall be tested for a normal load equal to one and a half (1,5) times the specified working load (that is the Serviceability Limits States) or design load (that is the Ultimate Limits States for Service or Seismic conditions), whichever is greater.

The normal load is defined as a load acting orthogonally to the bearing sliding surface and is the transversal bridge force acting on the present transversal deck stopper device; the acting force for SLS, ULSs and ULSh conditions are defined on the relevant Bearing Layout drawings.

The test load shall be applied in five equal increments and the test load held for 1 hour or until deformation ceases, whichever is the greater. The load shall then be removed in equal decrements as the load increment. A second cycle of load increment and decrement shall be applied with the maximum test load being held for 30 minutes. The load deformation graph shall be plotted for both load cycles and the 'set' determined. If the 'set' exceeds a value deemed to be excessive by the Engineer, the Engineer may require all bearings to be pre-loaded before installation. At the end of the vertical load test, the bearing shall be dismantled and the bearing surfaces examined.

•**Friction Test:** Friction test for sliding surfaces shall be performed at constant normal loads of 50 and 80% of the specified load. The horizontal load shall be applied to obtain a steady rate of movement of 1mm per minute to reach a total movement of 30mm or as directed by the Engineer.

•**Sampling:** At least one type of each bearing, selected at random, shall be load tested unless the type of bearing is a part of a standard product with well documented production test data, in which case the Engineer may agree to accept the production test results in lieu of independent testing.

3.6.3.10 Payments

Payment for all type of test and sampling as required shall be born by the contractor at his own cost.

3.6.4 Inspection and Testing

Where any patents are used, the manufacturer's certificate with test proofs shall be submitted along with the design and got approved by the Engineer before their use in work.

Test on Casting: tests specified in IS: 1030 shall be performed. Casting shall be ultrasonically tested and certificates submitted. Quality level of castings shall be level 3 as per IS:9565.

Test on Welding: all welding shall be tested by Dye Penetration Method. But welding shall be tested by Ultrasonic Method. The manufacturer shall certify soundness of welding.

Acceptance test on bearing:

All bearings shall be checked for overall dimensions

All bearings shall be load tested to 1.25 times design vertical load

A pair of bearings selected at random shall undergo testing in order to determine coefficient to friction, which shall be less than 0.05.

Two bearings selected at random shall be tested for permissible rotation.

3.7 Expansion joint

This work shall consist of fabrication and placing of expansion joints as indicated on the drawing and conforming to these specifications or as directed by the Engineer.

3.7.1 General

a) The expansion joints shall be designed and duly got approved by the Engineer. It shall cater

for expected movement and rotation of the structure at the joints and provide smooth riding surface. It shall also be easy for inspection maintenance and replacement

b) Expansion joints shall be robust, durable, water-light and replaceable. Site fabricated expansion joints shall be prohibited. Expansion joints shall be obtained by the Engineer either directly or through the Contractor from approved manufacturers and be of proven type.

c) For bridges with prestressed concrete superstructure, with individual span length more than 20 m or built with innovative design/construction elastomeric expansion joints of slab seal or strip seal type shall be provided.

d) For slab type of bridges of spans less than 10 metres continuous surfacing may be provided across the expansion gaps, supported on a -20 mm thick plate placed and fixed at the level of the deck slab.

e) For bridges other than those mentioned in (c) above with spans above 10 metres, an alternative specification of sliding steel plate joint or filled joints with copper plates may also be adopted if approved by the Engineer, apart from elastomeric expansion joint of slab seal or strip seal type.

f) Vehicular traffic shall not be allowed over expansion joints after its construction for such period as may be determined by the Engineer.

g) Proprietary type deck joints offered by the Contractor in lieu of the type specified shall comply in all respects with the manufacturer's specifications and meet the required range of movements and rotations and be fit for the purpose of ensuring satisfactory long term performance in the bridge.

Where alternative type proprietary deck joints are proposed by the Contractor, the following information shall be provided.

- i) Name and location of the proposed manufacturer.
- ii) Dimensions and general details of the joint including material specifications, holding down bolt or anchorage details and installation procedures.
- iii) Evidence of satisfactory performance under similar environmental conditions of similar joints being produced by the manufacturer.

Any acceptance of alternative types will be at the sole discretion of the Engineer.

Such deck joints shall be installed in accordance with the manufacturer's recommendations and to the general requirements of this Specification.

No expansion joint shall be provided only for the width of the carriageway. It shall follow the profile including the kerb and the footway and fascia, if provided. The type of expansion joint for the latter may be made different from that used for the carriageway expansion joint.

3.7.2 Requirements

The requirement criterion will be separately applicable for the expansion joint proper and the transition zone of attachment to the deck.

There are two types of performance requirements for the expansion joint proper viz. from the necessity of the bridge and from the road users e.g. man, animal and vehicle.

3.7.2.1 Performance Requirement with Respect to Bridges

The expansion joint shall:

- a) Withstand the imposed load including the impact load from live load and other sources.
- b) Allow expansion and contraction movement due to temperature, creep, shrinkage, prestressing and structural deformations.

- c) Permit relative rotation in elevation and plan due to the causes as noted above,
- d) Be waterproof. Bridge deck expansion joint seals play a critical role in preventing the degradation of the structural components of the bridge system. Without effective joint seals, water passes through the bridge deck and works harmfully to corrode steel components and cause deterioration of the concrete. Rain water gathers various corroding additives from the atmosphere and also from the carriageway.
- e) Ensure sealing. In case bridge deck joints are not sealed, apart from loss of waterproofing, grit and other forms of road debris may enter the joint. Debris, when impacted with the joint can seriously restrict the movement instead of facilitating the same. In the case of proprietary joints being accepted for adoption, the sealing shall be as specified by them,
- f) Ensure long life by being resistant to corrosion,
- g) Be easy to install,
- h) Be easy to maintain. Replace ability of expansion joint shall be one of the basic criteria for selection of type of expansion joint,
- i) Be resistant to the materials likely to collect/spill over the deck in its normal service.

3.7.2.2 Performance Requirement with Respect to User

The expansion joint shall:

- a) Provide smooth continuity at the top of the deck for riding comfort,
- b) Be of skid resistant surface,
- c) Be non-damaging to the rubber tyre,
- d) Make minimum noise during vehicular crossing.
- e) Ensure that animal paws and hooves should not get entangled where bridges are used by animal drawn traffic,
- f) Permit passing of bullock Cart steel tyre for bridges where bullock carts ply,
- g) Look good aesthetically.

3.7.2.3 Performance Requirement for Transition Zone

It is the zone of connection of joint assembly and the adjoining deck.

The expansion joint shall:

- a) Permit transfer of generated forces without distress, i.e... Without getting uprooted. The purpose will not be served if the bonding is with the wearing COM only. Anchorage must be provided with the deck structural element.
- b) Ensure that surface in the transition zone stays undisturbed during long term service.

2.7.3 Steel plate sliding expansion joints

- a) In this type of buried joint, the wearing coat shall be made continuous over the joint. The other alternative shall be to keep a gap in the wearing coat which is filled up with a seal and filler, to be provided in extremely hot areas.
- b) Materials for steel plates shall conform to Section 1900. The exposed metallic components shall be galvanized or coated with approved anti-corrosive paint. The thickness shall be 20 mm or so for obtaining satisfactory performance.

- c) Plates shall be placed to the line, grade and expansion gap shown on the drawings with any adjustment required for temperature, particular care being taken with the top of the plates.
- d) Plates shall be firmly held in place during concreting by methods approved by the Engineer,
- e) Any temporary bolts or other fixings which prevent relative movement of the adjacent pans of the joint shall be removed as soon as the concrete has set sufficiently to hold the expansion plates in their correct positions. In any case, temporary bolts or other fittings shall be removed within 6 hours of placing concrete unless otherwise directed by the Engineer.
- f) Care shall be taken to prevent damage to expansion joint plates or its coating.
- g) If any damage occurs the plates and coatings shall be restored by the Contractor to the satisfaction of the Engineer.
- h) Plates shall be free of oil, rust, loose paint or other similar material before coating.

3.7.4 Filler joints

- a) The components of this type of joint shall be at least 2 mm thick corrugated copper plate placed slightly below the wearing coat, 20 mm thick compressible fibre board to protect the edges. 20 mm thick premoulded joint filler filling the gap upto the top level of the wearing coat, sealed with a joint sealing compound.
- b) The material used for filling expansion joint shall be bitumen impregnated felt, elastomer or any other suitable material, as specified on the drawings. Impregnated felt shall conform to the requirements of IS:1838, and shall be got approved from the Engineer, The joint filler shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.
- c) Expansion joint material shall be handled with care and stored under cover by the Contractor to prevent damage.
- d) Any damage occurring after delivery shall be made good to the satisfaction of the Engineer and at the expense of the Contractor.
- e) Joint gaps shall be constructed as shown on the drawings, Surfaces of joint grooves shall be thoroughly cleaned with a wire brush to remove all loose materials and dirt and debris, then washed or jelled out.
- f) Pre-moulded expansion joint filler shall not be placed in position until immediately prior to the placing of the abutting material. If the two adjacent surfaces of the joint are to be placed at different times, this type of joint filler shall not be placed until the second part is about to be placed.
- g) Sealants shall be installed in accordance with the manufacturer's recommendations and all appropriate requirements; For joint face priming,
- h) Sealants shall be finished approximately 3 mm below the upper surfaces of the joint,
- i) Joint materials spill or splashed onto finished surfaces of the bridge during joint filling operations shall be removed and the surfaces made good to the Engineer's approval.
- j) No joint shall be sealed until inspected by the Engineer and approval is given to proceed with the work.

3.7.5 Elastomeric slab seal expansion joint

3.7.5.1 Materials

- a) Steel inserts shall conform to IS: 226. Use of any other materials like fiberglass or similar material shall not be permitted.

- b) Elastomer for elasiomeric slab unit (ESU) shall conform to clause 915.1 of KC: S3 (Pan 11), compounded to give hardness 1RHD 60 +5, subject to the following additional stipulations:
- (i) Chloropiene (CR) only shall be used in the manufacture of elasiomeric expansion joints. No reclaimed/natural rubber or vulcanised wastes shall be used.
 - (ii) The chloroprene material used in the manufacture of elastomeric (expansion joints) shall be Neoprene WRT. Bayprene 110, Skyprene B5 or Denka S- 40V.
 - (iii) Chloroprene content of the compound shall not be lower than 60 percent by weight. The ash content shall not exceed 5 pr cent (»s per tests conducted in accordance with ASTM D-297 for (i) and (ii) above.
 - (iv) EPDM and other similar candidate elastomers for expansion joints shall not be permitted.
- c) Elasiomeric plugs,
- d) Spacer bars, marked with centre to centre distance of fixing holes.
- e) Fixing bolts and nuts made of stainless steel.
- f) Anchor bars comprising hooked anchor stiffeners welded with tower steel inserts and sinusoidal anchor bars welded with horizontal leg of the edge steel inserts. The elaborate anchoring arrangements of steel inserts shall be permanently welded tied with the steel reinforcement

3.7.5.2 Fabrication

- a) Steel inserts shall be grit blasted and provided with epoxy paint.
- b) Edges of reinforcing steel sections shall be founded.
- c) Expansion joints shall be fully moulded to the required size in one single vulcanising operation including the encasing layers as integral and homogeneous part.
- d) Tolerances of fabrication shall be as follows:
- i) Plan dimension -> ± 5 mm
 - ii) Total height -> ± 3 mm

3.7.5.3 Supply and Handling

- i) The Contractor shall supply all steel-reinforced elasiomeric expansion joints including bolts, nuts, sealant, plugs and all other accessories for the effective installation of the joints including angled jointing sections for kerbs.
- ii) Expansion joint material shall be handled with care and stored under cover by the Contractor to prevent damage. Any damage occurring after delivery shall be made good at the expense of the Contractor to the satisfaction of the Engineer.

3.7.5.4 Installation

Expansion joints shall be installed as per approved drawing. Steel inserts, spacer bars, concreting of pockets, fixing of elastomer slab unit and presetting, etc., shall be done as per the following:

a) Steel Inserts

- (i) Deck casting shall be done leaving pockets or recess for steel inserts and anchors of the expansion joint as per drawing.

- (ii) Steel inserts shall be lowered at the appropriate location inside the pocket
- (iii) The top of the insert shall be flush with the finished level of wearing course maintaining the camber.
- (iv) Spacer bars, duly set appropriately to the month of installation, shall be filled under proper supervision.
- (v) Anchor rods shall be tied/welded with the existing deck main reinforcement, maintaining level and alignment.
- (vi) Welding between anchor rods and deck reinforcement is preferable. If welding is not possible, strong steel tie wires shall be used for fastening, under proper supervision,

b) Spacer Bar

- (i) Spacer bars shall be used to ensure proper positioning of bolts and also leveling of the steel inserts during fixing of the same with the deck reinforcement and casting second stage concreting in the pocket thereafter.
- (ii) The 2nd stage concreting operation shall preferably be started within 24 hours of fixing the steel inserts. In such cases, spacer bars should be removed just after concreting is finished. If there is a substantial time lag between fixing of inserts and concreting, then any one of the following methods shall be adopted, depending on the support condition:
 - a) For simply supported bridge resting on simple elasiomeric bearings, (with no dowel pins), insert shall be placed in position with spacer bars at every alternate joints. Such joints shall be called restrained joints hereafier. In other words, inserts shall not be fixed simultaneously at two ends of one span. If the above condition is satisfied, inserts with spacer bars shall be kept in position for a substantially longer period at such restrained joints. Spacer bars shall be removed after concreting of such restrained joints and inserts placed in position with spacer bars at the other unrestrained joints thereafter.
 - b) For bridges resting on other than elasiomeric bearings (including bearings with dowel pins at one end), after placing and aligning the inserts and securing the same, the spacer bars shall be removed. Concreting shall be done with great care so that inserts are not dislocated or distorted.
 - (iii) While removing the spacer bar after concreting, one must take care to see that the concrete is not damaged during withdrawal of spacer bar. If the spacer bar happens to be snugly fitted, it shall not be pulled by any means; it shall be gas cut in two pieces and then removed.

c) Concreting of Pocket

- (i) Concreting of pocket shall be done with great care using proper nonconforming 10 grade similar to that of the deck casting besides ensuring efficient bonding between deck and steel insert. Also proper care shall be given for ensuring efficient bonding with the already cast concrete.
- (ii) Needle vibrators shall be used. Care shall be taken so that the position of steel insert is not disturbed during vibration.
- (iii) Spacer bar shall be removed within an appropriate time before the joint is required to permit movement,

d) Railing of Elastomeric Slab Unit (ESU)

- i) Special jig shall be used to preset the ESU during installation
- ii) ESU (mounted on the jig. if preset) shall be lowered to position.

- iii) The line and level on the ESU should be adjusted.
- iv) ESU shall be removed and coated with special adhesive
- v) ESU shall be placed in position again, ensuring waterproof joining at required faces.
- vi) ESU shall be tightened with stainless steel nuts and lock washers in position. Tightened nuts shall be locked with lock washers.
- vii) Special sealant shall be poured inside the plug holes.
- viii) The elastomeric plugs shall be pressed in position after applying adhesive on the appropriate surface.
- ix) ESU shall be fitted in position after completion of wearing course. While completing this part of the wearing course, adequate care shall be taken to ensure a waterproof joining with the already existing wearing course,

e) Pre-Setting

- i) The main purpose of presetting of the steel inserts at the time of its installation is to ensure as closely as possible the condition that in the long run at the mean average annual temperature, the ESU remains at its nominal state.
- ii) Major factors responsible for changing the longitudinal length of the bridge superstructure are indicated below:
 - a) Temperature variation from annual mean.
 - b) Changes due to shrinkage of concrete.
 - c) Changes due to elastic shortening and creep of the prestressed bridge superstructure.
 - d) Deformation of superstructure and substructure, if any. Resultant changes in expansion gap due to first factor can occur in both directions from any pre-selected mean position whereas changes due to creep and shrinkage are unidirectional such that the expansion gap continuously increases with passage of time. The steel insert unit of expansion joint can be fixed in any month of the year. As stated earlier, the expansion gap between bridges superstructures may vary from time to time; hence the initial fixing distance between fixing points will obviously depend on the month of installation of steel insert. The c/c distance between stainless steel fixing of bolts as indicated in the drawing can be taken as only nominal. The same shall be modified by presetting depending on:
 - i) The difference between the mean temperature of the month of fixing of steel insert and the annual average temperature.
 - ii) The elapsed period between the casting and/or prestressing and fixing of steel insert for calculating the remnant creep and shrinkage.

3.7.5.4.1 Special requirements for installation

- (i) Prior to construction of bridge deck area adjacent to the joint, the supplier shall provide detailed working drawings showing the location of all bolts, recesses and holes necessary for the installation of the joint. Reinforcing bars in superstructure shall be amended as required to ensure that there will be no interference in the installation of the joint.
- (ii) All bearing surfaces and recesses which are in contact with the joint assembly shall be checked with a straight edge to ensure flatness of profile.
- (iii) No holes shall be drilled for fixing bolts within 7 days of concreting. Holes for the bolts shall be drilled to the size and depth shown on the drawings,
- (iv) Sections of the jointing making the completed joint shall follow a straight line.

- (v) The fixing bolts shall not be placed in a position until at least 4 weeks after stressing is completed in post-tensioned box or beam and slab structures. Prior To placing sections of jointing, contact surfaces shall be cleaned to remove all grease, tar, paint, oil, mud or any other foreign material that may affect adhesion of the sealant.
- (vi) Sealant shall only be applied to dry contact surfaces. Sufficient sealant shall be applied to the contact surfaces to cause extrusion of sealant when the jointing is fixed in position.
- (vii) Final sealing of the finished expansion joint shall be completed immediately after completion of installation. All exposed ends, joints between units and other areas of possible leakage shall be filled with sealant. All voids between the sides of the jointing and concrete or plates shall be filled with sealant.
- (viii) Boll cavities shall be cleaned and plugged with neoprene cavity plugs. Prior to placing the plugs sufficient sealant shall be placed in the cavities to cause extrusion of the sealant by the plugs.
- (ix) All excess sealant shall be removed from the jointing and adjacent areas.

3.7.5.5 Acceptance test

As per clause 918.7 of IRC-83 (Part II), necessary quality control certification by the manufacturer in regard to properties of Elastomer and steel will be furnished.

For severe environment, ozone resistance test as per clause 915.2.3 of IRC: 83 (Part II), shall be carried out for elastomer.

The properties of the elastomer shall conform to Table I of clause 915.2 of IRC : 83(Part II).The acceptance testing for elastomer, material shall conform to clause 918.4.1.2 of IRC : 83 (Part II) with additional criteria as stated in Clause 2005. 2606.5.2 . The fabricated expansion joint/shall be- subjected to the following acceptance tests:

- i) Routine test. Each expansion joint shall be tested- for at least 100 cycles for a test movement which shall be 10 per cent more than the design expansion contraction movement
- ii) In addition to routine test, one out of every 20 expansion joints shall be subjected to the test movement for 4000 cycles. The lot shall be rejected if the elastomer material shows signs of fatigue or permanent set or distress in the test, the test piece shall not be used in the
- iii) The type test for abrasion resistance shall be carried out for one joint out of every 20 not, as per IS : 3400 (Part 1 3) and the standard deviation shall be within ± 20 per cent

N.B, the manufacturer shall preferably have in-house testing facility. Otherwise, the testing shall be got done by him at his expense at any testing establishment selected by the Engineer, A manufacturer who cannot carry out the acceptance test shall not be entitled to supply elastomeric slab seal joint.

3.7.6 Strip seal expansion joint

3.7.6.1 Components

Strip seal expansion joint shall comprise the following items:

- a) Edge beams - This special claw leg profiled member shall be of extruded rolled steel section combining good weld ability with notch toughness.
- b) Strip seal - This shall be of chloroprene with high tear strength, insensitive to oil, gasoline, and ozone. It shall have high resistance to aging. This component, provided to ensure water tightness, shall have bulbous shape of the part of the seal which is inserted into the groove,

provided in the edge beam. The sea) should be vulcanised b single operation for minimum full length of joint,

- c) Rigid Anchorage - This shall be welded to the edge beam at staggered distance.
- d) Anchor loops - This shall be made of weld able steel connecting the rigid anchorage with deck reinforcement 2607.2. Material
- a) Edge beam of this special section are at present being directly imported in India. The steel shall conform to steel grade Rs t 37-2 of Gentian Standard or equivalent
- b) Chloroprene of strip seal shall conform to clause 915.1 of RC:83 (Pan II). The properties of chloroprene shall conform to Table 2600-1.
- c) Anchorage steel shall conform to IS : 2062.
- d) Anchor loop shall conform to IS: 2062.

Table 1 - STRIP SEAL ELEMENT SPECIFICATION

Sealing element is made of chloroprene and must be a extruded section. The working movement range of the sealing element shall be at least 80 mm with a maximum of 100 mm at right angles to the joint and ± 40 mm parallel to the joint.

PROPERTY	SPECIFIED VALUE
Hardness	63 \pm 5 Shore A
Tensile Strength	Min 11 MPa
Elongation at fracture	Min 350 per cent
Tear Propagation Strength	
Longitudinal	Min 10 N/mm
Transverse	Min 10 N/mm
Shock Elasticity	Min 25 per cent
Abrasion	Min 220 mm ³
Residual Compressive Strain	
(22 h/70 deg C /30 per cent strain)	Max 28 per cent

PROPERTY	SPECIFIED VALUE
Ageing in hot air (14 days/70 deg C)	
Change in hardness	Max +5 Shore A
Change in tensile strength	Max -20 per cent

Change in elongation at fracture	Max -20 per cent
Ageing in ozone (24 h/50pphm/25 deg C/20 per cent strain)	No cracks
Swelling behavior in Oil (116 W25 per cent C) ASTM Oil no. Volume Change	Max 5 per cent
Change in hardness	Max 10 Shore A
ASTM Oil no.3Volume Change	Max'25 per cent
Change in hardness	Max 20 Shore A
Cold Hardening Point	Min -35 deg C

3.7.6.2 Fabrication (Pre-installation)

a) Rolled steel profiles for edge beams shall be long enough to cater for a 2-lane carriageway. These shall be cut to size of actual requirements by means of a mitre box saw. Alignment of the cut -to- size steel profiles shall then be made in accordance with the actual bridge cross-section on work tables. For this purpose, the contour of bridge cross-section shall be sketched onto these tables. After the steel profiles are aligned, they will be chucked to the tables by means of screw clamps and laced by arc welding.

b) Anchor plates shall be cut to the required size by gas cutting. These shall be welded to the edge beams.

c) Anchor loops shall be bent to the required shape and welded to anchor plates.

d) The finally assembled joints shall then be clamped and transported to the work site. 2607.4. Handling and Storage

a) For transportation and storage, auxiliary brackets shall be provided to hold the joint assembly together.

b) The manufacturer shall supply either directly to the Engineer or 10 The Bridge Contractor all the materials of strip seal joint? Including sealants and all other accessories for the effective installation of the jointing.

c) Expansion joint material shall be handled with care; it shall be stored under cover on suitable lumber padding by the Contractor to prevent damage. Any damage occurring after delivery shall be made good at the Bridge Contractor's expense to the satisfaction of the Engineer.

3.7.6.3 Installation

The width of the gap to cater for movement due to thermal effect, prestress, shrinkage and creep, superstructure deformations (if any) and sub-structure deformations (if any) shall be determined and intimated to the manufacturer. Depending upon the temperature at which the joint is likely to be installed, the gap dimension shall be preset.

Taking the width of gap for movement of the joint into account, the dimensions of the recess in the decking shall be established in accordance with the drawings or design data of the manufacturer. The surfaces of the recess shall be thoroughly cleaned and all dirt and debris removed. The exposed reinforcement shall be suitably adjusted to permit unobstructed lowering of the joint into the recess.

The recess shall be shut tered in such a way that dimensions in the joint drawing are maintained. The formwork shall be tight.

Immediately prior to placing the joint, the presetting shall be inspected. Should the actual temperature of the structure be different from the temperature provided for presetting, correction of the presetting shall be done. After adjustment, the brackets shall be tightened again,

The joint shall be lowered in a pre-determined position. Following placement of the joint in the prepared recess, the joint shall be leveled and finally aligned and the anchor loops on one side of the joint welded to the exposed reinforcement bars of the structure. Upon completion, the same procedure shall be followed for the other side of the joint. With the expansion joint finally held at both sides, the auxiliary brackets shall be released, allowing the joint to take up the movement of the structure.

High quality concrete shall then be filled into the recess. The packing concrete must feature low shrinkage and have the same strength as that of the superstructure, but in any case not less than M 35 grade. Good compaction and careful curing of concrete is particularly important. After the concrete has cured, the movable installation brackets still in place shall be removed,

Rolled up neoprene strip seal shall be cut into the required length and inserted between the edge beams by using a crow bar pushing the bulb of the seal into the steel grooves of the edge beams. A landing to a bead shall be formed in the thickened end of the edges of the seal which would force the thickened end against the steel beam due to wedge effect when the strip seal is buttoned in place.

As soon as the concrete in the recess has become initially set, a sturdy ramp shall be placed over the joint to protect the exposed steel beams and neoprene seals from site traffic. Expansion joint shall not be exposed to traffic loading before the carriageway surfacing is placed.

The carriageway surfacing shall be finished flush with the top of the steel sections. The actual junction of the surfacing/wearing coat with the steel edge section shall be formed by a wedge shaped joint with a sealing compound. The horizontal leg of the edge beam shall be cleaned beforehand. It is particularly important to ensure thorough and careful compaction of the surfacing in order to prevent any premature depression forming in it.

Acceptance Test

- i) All steel elements shall be finished with corrosion protection system.
- ii) For neoprene seal, the acceptance test shall conform to the requirements stipulated in Table - 1 It shall also be stretch tested. If a manufacturer is to supply this type of joint, they will have to produce a test certificate accordingly conducted in a recognised laboratory, in India or abroad.
- iii) In view of the importance of the built up edge beams, special investigation of fatigue strength of this section with anchorages to withstand 2 \ \Cf load change cycles without showing signs of damage, will be required. The supplier shall have to produce a test certificate in this regard, conducted in a recognised laboratory, in India or abroad.
- iv) The manufacturer shall produce test certificates indicating that anchorage system had been tested in a recognised laboratory to determine optimum configuration of anchorage assembly under dynamic loading.
- v) The manufacturer shall satisfy the Engineer that water tightness test for the type of joint has been carried out in a recognised laboratory to check the water tightness under a water pressure of 4 bars.
- vi) As strip seal type of joint is specialized in nature, generally of the proprietary type, the manufacturer shall be required to produce evidence of satisfactory performance of this type of joint.

3.7.7 Tests and standards of acceptance

The materials shall be tested in accordance with these specifications and shall meet the

prescribed criteria. The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

3.7.8 Measurements for payment

The expansion joint shall be measured in running meters. For filled joints, the rate per running metre shall include the cost of sealant for the depth provided in this drawing.

3.7.9 Rate

The contract unit rate shall include the cost of all material, labour, equipment and other incidental charges for fixing the joints complete in all respects as per these specifications in the case of Bridge Contractor supplying the expansion joint. If the manufacturer supplies the expansion joint directly to the Engineer, the cost of installation, handling and fixing shall be borne by the Bridge Contractor.

3.8 PRE-CAST ELEMENTS (CONCRETE)

3.8.1 General

This Chapter applies to the providing and placing of precast concrete elements.

3.8.2 Materials

The concrete grade shall be M25 or as shown on the drawings and shall conform to the requirements specified in the IS: 456. The reinforcement steel shall be placed as shown on the drawing and conform to the requirements specified steel grade Fe 500 as per IS: 1786.

3.12.3 Submissions by the Contractor

The Contractor shall submit within 6 weeks of the LoA a methodology for the execution of the works for the pre-cast elements for approval by the Engineer. This methodology shall include to a minimum:

- Formwork design
- Casting, curing and removal process
- Handling, storage, transporting, lifting and placing
- Testing and quality control procedure

3.8.4 Execution

R.C.C Precast concrete elements shall be of Z-Shape and the dimensions shall conform to the details shown on the final construction drawing. Length of each element will be approx. 2.0m. Casting of elements shall not start earlier than 6 weeks before intended placing.

3.8.4.1 Casting

The elements shall be cast on flat area of a specially prepared mould. Lug connectors and lifting devices shall be cast in place to the dimensions and tolerances shown on approved system drawing and lug connectors shall be set prior to casting. The concrete in each unit shall be placed without interruption and shall be compacted by the use of an approved vibrator supplemented by such hand tamping as may be necessary to ensure that the concrete reaches into the corners of the forms and prevent formation of stone pockets or cleavage planes. Clear form oil of the approved and only from single manufacturing source shall be used throughout the casting operations to avoid colour variation.

3.8.4.2 Curing

The precast elements shall be cured for a sufficient length of time as approved by Engineer so that the concrete develops the required compressive strength. Only fresh potable water shall be used for curing.

3.8.4.3 Removal of forms

The forms shall remain in place until they can be removed without damaging the elements. The scheme of removal of form work shall be as per relevant clause of IS: 465.

3.8.4.4 Scribing

The date of manufacture and nomenclature shall be clearly scribed on the rear face of each unit.

3.8.4.5 Concrete Finish

The face of the elements shall have the finish of unformed surface and shall be roughly screened to eliminate open pockets of aggregates.

3.8.4.6 Tolerances

All elements shall be manufactured within the following tolerances:

- All dimensions within 5 mm
- Evenness of the face: ± 5 mm over 1500mm
- Difference between lengths of two diagonals: 10mm max.
- Thickness: ± 5 mm

3.8.4.7 Handling, Storage and transporting

All elements shall be handled, stored and transported in such manner as to eliminate the danger of chipping, cracks, fracture and excessive bending stresses. Concrete elements in storage shall be supported on firm blocking located adjacent to the tie-strips to avoid bending.

3.8.4.8 Acceptability

Acceptability of the precast concrete elements shall be determined on the basis of compression tests, as per IS:456 and visual inspection. A minimum of one sample of 6 cubes shall be taken for each lot of 5 cum or 12 cubes above 5 cum per day. Elements shall be acceptable for placement in the structure if the strength at 10 days, or before, exceeds 75% of the 28 days requirements.

3.8.4.9 Rejection

Elements shall be subject to rejection in case of failure to meet any of the requirements specified above. In addition, defects, which indicate imperfect moulding, or defects indicating honeycombed or open textured concrete, shall be sufficient cause for rejection.

3.8.5 Measurement and Payment

The precast concrete lagging shall be measured and paid per cubic meter of concrete casted as per the relevant drawing or instructed by engineer. The rate shall include all labour, materials, equipment, lead, lift, handling, wastage complete with Contractors own equipment for complete job in accordance to specifications and shown on the drawings or as instructed by the Engineer.

The reinforcement and cement shall be paid separately as per relevant items of BOQ.

3.8.2 Specification Movements

Movement	Value
Longitudinal	± 100mm
Lateral	± 50mm
Vertical	± 75mm

3.8.3 Testing Requirements

Test	Unit	Test Values
Density	g/cm ³	1.47 – 1.51
Tensile Strength	N/mm ²	>4
Fracture Strain	%	>600
Tear growth Resistance	N/mm	>8
Fire behavior		Material Class E (EN ISO 13501 1)

CHAPTER - IX

Construction Methodology

CONSTRUCTION METHODOLOGY

1. Construction methodology for superstructure of Bridge and No. 2,3 & 61 and transportation of steel girder methodology will be submitted by the contractor and after approval of NR/BBJ. The said methodology shall be implemented at site.

2.0 ROLE OF THE ENGINEER

The Engineer is appointed by the Authority for the purpose of the Contract.

The Engineer will decide all questions that may arise as to the quality and acceptability of materials furnished, work performed, and the rate of progress of the Work; the interpretation of the Plans and Specifications, and all questions as to the acceptable fulfillment of the Contract on the part of the Contractor. The Engineer will determine the quantities of the several kinds of work performed and materials furnished which are to be paid for under the Contract and his determination shall be final.

The Engineer will have the authority to suspend the Work wholly or in part due to the failure of the Contractor to correct conditions unsafe for the workmen or general public; for failure to carry out provisions of the Contract, or for failure to carry out orders; for such periods as he may deem necessary due to unsuitable weather; for conditions considered unsuitable for the execution of the Work; or for any other condition or reason deemed to be in the public interest.

The Contractor may request and will receive written instructions from the Engineer upon any important items.

The Contractor shall obtain from the manufacturer and submit to the Engineer certificates showing that tests of materials have been carried out in accordance with the requirements of this Specification.

The Contractor shall agree with the Engineer in writing on the date and place of test, at least one week before the date of the test. The Contractor may proceed with the test if the Engineer confirmed in writing that he is unable to attend the tests. However, the Contractor shall furnish to the Engineer the certified copies of the test results.

If as a result of such inspection, examination or test the material is found to be defective or not in accordance with the Contract, the Engineer shall notify the Contractor of his rejection in writing. The Contractor shall furnish the Engineer a method statement which defines how and when the defect is to be made good. The method statement shall be submitted within 48 hours after the Contractor receives written notification from the Engineer.

Upon the acceptance of the method statement by the Engineer, the tests shall be repeated under the same terms and conditions. The Contractor shall immediately make good the defects or ensure that the materials complies with the Contract. Unless otherwise accepted by the Engineer all quality assurance testing shall be performed by a accredited/approved testing laboratory to be appointed by the Contractor.

The Contractor shall keep such site records as are required by the Engineer to ensure effective quality assurance of workmanship and materials. Such records shall include, but not be limited to, the following:

Daily maximum and minimum temperature

Rainfall

Materials testing of all aggregates, cement and concrete identifying the section of works to which they relate

Casting dates for in-situ and precast concrete

Formwork striking

Dates of structural steelwork shot blasting and painting together with paint film thickness

Dates of inspection of steelwork fabrication and records of tests carried out

Tests on fire resistance of materials

Detail of filling materials, their location in the Works, dates of placing and compaction test

Pilings

Welding

Detail of prestressed members, including moulds, concrete and tensioning

Inspection/certification by Professional Engineers and Safety Officers

3.0 QUALITY ASSURANCE AND CONTROL METHODOLOGY

3.1 General Requirements

The Contractor shall document and implement a Quality Management System (QMS) that shall remain in effect during all the Contractual period.

The Contractor's QMS shall be ISO 9001:2008 (or ISO 9001:2015) certified (by an Independent Certification Body) and be in compliance with the requirements of the Contract.

The Contractor shall establish Quality Assurance (QA) and Quality Control (QC) Program to define the Contractor's approach and methodology towards achieving the contract quality requirements. The QA and QC Program shall provide assurance that the Contractor performs sufficient verifications of all items of the Works , so as to ensure that all materials, workmanship, construction, installation, functional performance and identification conform to applicable contractual specifications and drawings.

The Contractor shall submit his QMS documentation for Review and Approval by the Engineer as specified in herein.

If the Contractor is a consortium, partnership or joint venture, the QMS documentation shall be prepared jointly by the companies comprising the consortium, partnership or joint venture, and shall identify a single standard and/or procedures for the whole of the consortium, partnership or joint venture.

The Contractor shall assign a Quality Control Manager with appropriate qualifications – formal training and on-the-job experience in quality systems – and shall constitute a Quality Management Team (with qualified Quality Inspectors) to assist the Manager to ensure the QA/QC Program application to the construction activities.

Within 10 days after the Commencement date, the Contractor shall submit to the Engineer, for approval, the qualifications of the Project's Quality Management Team.

3.2 Quality Management System documentation

The Contractor's QMS documentation shall include:

Construction Quality Assurance and Control Plan (CQP);

Quality Procedures and Work Instructions; and

Inspection and Test Plans;

Within thirty (30) days since the Contract signature, the Contractor shall submit for Review and Approval by the Engineer the "Construction Quality Plan" (CQP).

The CQP shall be in compliance with the applicable "Quality Assurance Manual for complete the bridge", developed by the Consultant.

The Construction Quality Plan shall have a standardised format and shall be based on those outlined by BS ISO 10005; it shall define all measures necessary to meet the Requirements of the Contract at all appropriate phases of the contractual phases and methodology to assure compliance with all applicable regulations, standards and laws.

The CQP shall include all Quality requirements that will be applied to the bridge construction as in the following list:

Quality Plan for the control of activities within each category of work or discrete element of procurement, manufacturing, delivery, construction and installation of the Works, including Temporary Works.

QMS procedures and any associated system instructions and/or forms which the Contractor proposes to use for the Contract; and

Inspection and Test Plans (ITP).

The Contractor's QMS documentation is to be regularly reviewed and up-dated to reflect changes to work practices and/or changes to policy and legislation and the like.

In relation to the contractual scope of work, the CQP for the construction design, manufacturing, construction, installation, testing and commissioning activities shall define:

The organisation of the Contractor's staff directly responsible for the day to day management of the work on or off the Site and for construction design;
the specific allocations of responsibility and authority given to identified personnel for the day to day management of the work with particular reference to the construction design, supervision, inspection and testing of the manufacturing and construction works;

The interfacing or co-ordination required with the Contractor's other related quality plans;

Quality assurance and control procedures for the construction design activities;

Identification of specific methods of manufacturing that will require that method statements are documented prior to commencing the activity;

The inspection and test plans to manage and control any test and inspection activities;

Forms and formats to be used to record the activities under the Manufacturing and Construction works shall be attached at the end of each section or reference included to existing standard procedures;

The specific methods of construction to identify any relevant method statements;

The procedures, instructions and forms to be applied to manage and control the following:

The purchasing of materials and ensuring they comply with the Requirements including purchasing documentation and specific verification arrangements for Contractor/Engineer inspection of material or manufactured product prior to release for use/installation;

The manufacturing process so as to ensure clear identification and traceability of material and manufactured parts;

The Quality Control requirements and quality control list;

The identification of the inspection and test status of all material and manufactured products during all stages of the manufacturing process to ensure that only products that have passed the required inspections and tests are dispatched for use and/or installation;

The construction process including Temporary Works so as to ensure compliance with drawings and specifications;

The inspection and testing activities of incoming materials, in process and final product;

The review and disposition of non-conforming material or product so as to avoid unintended use/installation;

The assessment and disposition of nonconforming material and nonconforming manufactured product and approval for reworking or rejection as scrap;

The handling, storage, packaging, preservation and delivery of product.

Inspection and Test Plans shall be produced for all activities requiring test and/or inspection. Each ITP shall identify the quality objectives and include:

The personnel responsible for undertaking and certifying the inspection and/or testing;

The procedure or instructions for the inspection and/or testing;

The test method or a reference to the relevant standard of testing;

The inspection and/or testing required prior to commencement of an activity;

The inspection and/or testing during an activity and its frequency;

The inspection and/or testing required to complete an activity;

All Hold Points;

All Witness Points;

Any notices or other documents to be given to the Engineer in relation to Witness Points and Hold Points;

The compliance criteria;

The method of analysis of test data;

The procedure for correction or disposal of any work which fails the compliance criteria;

Examples of the documentation to be used for reporting the results of inspections, tests and the analysis of test data;

The procedure for the distribution, filing and storage of inspection reports, test reports and reports on analysis of test data.

3.4 Quality Control

The Contractor shall prepare and maintain a list of quality control points which establish the criteria for control of each major component or activity during construction, manufacture, installation and commissioning, in accordance with the need to ensure the quality Requirements of the Contract.

The Quality Control requirements and list shall be include in the QCP.

The Engineer may instruct the Contractor to carry out additional inspections and/or tests that the Engineer deems appropriate.

Formal records of quality control inspection shall be retained by the Contractor, and be accessible to the Engineer as and when required.

The identification and storage of materials on Site shall be controlled such that the quality control status can be readily understood.

The Contractor shall give notice to the Engineer at least three (3) days before of when relevant work will be inspected and/or tested.

In relation to all Quality Control Points involving inspection and/or testing by the Contractor, the Engineer may elect to witness such inspections and/or tests. Witness by the Engineer shall not discharge the Contractor of the responsibility to provide compliant product, nor shall it preclude subsequent rejection by the Engineer.

The Contractor shall obtain certificates for each batch of manufactured goods or materials incorporated in the Works. Each certificate shall certify that the goods or materials comply with the Requirements of the Contract and shall include all reports of inspections and/or tests carried out at the place of manufacture.

The Contractor shall notify the Engineer of the places of manufacture and/or the source of supply of all goods and materials to be incorporated into the Works and shall give reasonable notice (which shall not in any event be less than thirty (30) days) to the Engineer before the start of any manufacturing and/or the supply of goods and materials.

The Engineer may reject any part of the Works, or require it to be uncovered, in the event of any failure by the Contractor to submit for Review by the Engineer.

The Contractor shall be responsible for the quality control of the Works executed by the Contractor of any level.

3.5 Inspection and Testing

Inspection and testing shall be carried out to ensure conformance with the Engineer's Requirements.

Where goods are supplied with recommendations or instructions as to how they are to be constructed, installed, assembled, handled and operated, quality control shall verify that such recommendations or instructions are adhered to.

At all reasonable times during manufacture, the Contractor shall permit the Engineer to examine and witness any of the Works being performed on the Contractor's premises off Site (including supplier's premises).

At least thirty (30) days before the Contractor intends to start the tests or inspections, the Contractor shall issue for Review by the Engineer a programme for the proposed factory tests and inspections and he shall regularly report progress and status to the Engineer. This programme shall conform to the Quality Control Plan and ITPs for the products concerned.

Before dispatch of goods, the Contractor shall ensure that all manufacturers' factory inspections and tests called for in the Engineer's Requirements and Quality Plans have been carried out.

The Contractor shall provide experienced staff to assist in all tests and the resetting of equipment, alarms and similar tasks. The Contractor shall correct those defects to the Works that may be encountered during such tests, even where the tests, are conducted after issue of a Taking Over Certificate. Furthermore a Non Conformity will be opened by the Contractor.

The Contractor shall include for laboratory testing of Materials and Plant as required to demonstrate compliance with the applicable standards, as specified or required by relevant authorities.

Laboratory testing shall be performed by competent testing laboratories.

All off-Site testing laboratories shall be registered, licensed or certified (preferably accredited ISO 17025) for capability to perform the proposed tests, by government agencies or appropriate certification agencies in the country where they operate. Details of laboratory control systems and capability/registration documents shall be submitted to the Engineer for Review, if so requested.

The Engineer may instruct that those tests are performed by an independent testing laboratory as designated by the Engineer.

All on-Site laboratories shall be established by an Independent Testing Organisation, or by the Contractor under the supervision of experienced and qualified supervisor.

The laboratory management plan and the qualifications and experience of supervisory staff shall be submitted to the Engineer for Review if so requested. The plan shall define the laboratory layout, equipment, management and testing procedures.

The Contractor shall arrange for an independent quality audit programme for his on-Site testing laboratories, to be carried out by recognised independent consultants or testing agencies whose reports shall be submitted to the Engineer for Review. Independent audits shall be conducted for:

- ❖ Initial acceptance;
- ❖ After a further six (6) months;
- ❖ Thereafter annually as a minimum during the operation of the laboratory.

On-Site laboratories shall not be used for testing Permanent Works until such laboratories have been subjected to the initial audit and approval for the appropriate activities by the Contractor's independent test agent/consultant.

The Contractor shall notify the Engineer of the timing for independent audits of testing facilities so that the Engineer may attend as an observer. The Engineer shall also be permitted to carry out further audits of the testing facilities as he deems necessary.

The Contractor shall create a schedule of Tests on Completion. The schedule shall be submitted by the Contractor to the Engineer for review not less than ninety (90) days before the first Test on Completion is due to commence. The schedule shall include an indicative programme showing when Tests would be conducted.

The Contractor shall inform the Engineer of commencement of each Test, giving not less fourteen (14) days of notice for Tests on Completion. The conditions associated with the attendance of the Engineer at Tests on Completion shall also apply to Tests.

Damage, including damage resulting from failure during Tests due to incorrect manufacture, installation or Tests on Completion shall be made good by the Contractor at the expense of the

The Contractor shall prepare two copies of a test report as soon as practicable after the completion of each test whether witnessed by the Engineer or not. If the Engineer has witnessed the test, he shall countersign the test report to indicate his agreement. If the Engineer has not witnessed the test, but the results and readings are satisfactory, he will return one copy of the test report to the Contractor with a notification in writing indicating his agreement with the tests and with the results and readings. Where the results of the test do not meet the Engineer's Requirements the Engineer may call for a retest.

The Quality Control and Verification systems shall be implemented and operated by personnel competent to perform and supervise the necessary inspections and tests.

Equipment used for inspection, measuring and testing shall be appropriate and fit for use. Such equipment shall be operated, maintained, checked and calibrated in accordance with the manufacturer's instructions. Instruments used during tests shall have been subjected to calibration tests and signed test certificates shall be supplied by the Contractor to the Engineer. Such calibration checks shall be undertaken prior to testing and, if required by the Engineer, shall be repeated afterwards.

The equipment shall be maintained and used in a manner that ensures measurement uncertainty is known and is consistent with the required measurement capability.

Following the Commencement Date, the manufacturers and places of manufacture, testing and inspection for the various items of the Works shall not be varied without the prior submission for review and approval by the Engineer.

3.6 Quality Management System Reports

The Contractor shall continuously monitor the performance of the QMS and shall specifically include in each monthly progress report:

- ❖ the status of all Quality Management System documentation;
- ❖ an up-to-date audit schedule and status;
- ❖ an up-to-date Non-conformity Register providing the status of all nonconformities identified by the Engineer and the Contractor;
- ❖ any other items as instructed by the Engineer.

The Contractor shall supply reports of each inspection and/or test. Such reports shall show the results of all the inspections and/or tests carried out and shall certify that the work has been inspected and/or tested in accordance with the Requirements of the Contract and that the work complies with the Requirements of the Contract.

Each report of inspection and/or test shall be signed by a representative of the Contractor who has been allocated the requisite authority under the relevant inspection and test plan.

The Contractor shall ensure that a signed copy report of any in situ and any off-Site inspection/test is filed in his records within three (3) days and within seven (7) days of the date of completion of the test process respectively.

The Contractor shall plan, perform and record all quality control activities to ensure that all work is performed in accordance with the QMS Documentation which has been Reviewed by the Engineer, and complies with the Requirements of the Contract.

The Engineer may require the Contractor to carry out further additional inspections and/or tests as are in their opinion appropriate.

The Contractor shall provide and maintain at all stages of the Work a quality control register or registers to identify the status of inspections, sampling and testing of the Work and all certificates. These registers shall be maintained current at all times.

The Contractor shall submit to the Engineer, weekly summaries based on each quality control register showing the type and amount of certification received and the sampling, inspection, and/or testing undertaken on each element of the Works during the previous week. The summaries shall identify and demonstrate the compliance of such certification, sampling, inspection and/or testing with the Requirements of the Contract and shall identify any item which does not conform to the Requirements of the Contract.

A summary report that details all quality control activities in previous month shall reach the Engineer's office before the seventh (7th) working day of each month.

This report shall:

- ❖ list the certificates received for each batch of manufactured goods or materials incorporated in the Works and compare this against the certification required by the Contract and the Contractor's quality plans;
- ❖ list the inspection, sampling and testing activities undertaken by the Contractor on each element of the Works and compare these activities against the amount of inspection, sampling and testing required by the Contract and the Contractor's quality plans;
- ❖ show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the acceptance criteria; and
- ❖ reference any actions proposed by the Contractor to overcome any nonconformities identified by the Contractor and by the Engineer.

3.7 Contractor Audits

The Contractor shall ensure that audits of all the activities in the QCP are carried out at quarterly intervals, or at such other intervals as the Engineer may require, to ensure the continuing suitability and effectiveness of the quality system. Reports of each such audit shall be submitted promptly to the Engineer.

The Contractor shall submit for review by the Engineer details of the authority, qualifications and experience of personnel assigned to design verification, to audit activities, and to inspection and testing activities.

The Contractor shall enable the Engineer to carry out audits / assessments at various design and software development stages and the Contractor shall address and resolve all issues arising from the audits / assessments.

3.8 Engineer Audits

Quality audits may be conducted by the Engineer or any other designated authority, to verify the implementation and maintenance of the QMS.

During the Contract period, upon receipt of Corrective Action Request (CAR), Non Conformance Report (NCR), or similar issued by the Engineer as a result of quality audit, the Contractor shall submit for review a proposed corrective and preventive action plan within fourteen (14) days of notification.

3.9 Non Conformance

Where a non-conformance in a work item is noted the Contractor shall raise a Non-conformance Report (NCR).

Where a specified work activity has not been carried out in accordance with the agreed QMS requirements, a NCR shall also be raised.

A NCR may also be raised in case of defective / damaged material or equipment.

The Contractor shall propose a resolution and disposition for each Non-conformance Report, comprising one or more of the following:

Repair – the process of restoring a non-conforming item to a condition such that the capability of the item to function reliably and safety is unimpaired, even though that item may not conform to the original design requirements after repair.

Rework – the process of bringing a non-conforming item into its original condition by a remedial action on the part of the Supplier, Contractor or independent third party. i) Completing or supplying missing documentation is considered rework.

Reject – the process of discarding or destroying a non-conforming item to prevent its inadvertent use. i) This is typically followed by the supply of an acceptable replacement item.

Use “as is” – the evaluated approval of a non-conforming item “as is” when it can be established that the non-conformance will not adversely affect the functional requirements (including performance, merchantability, maintainability, fitness and safety) of the item. i) A “Use as is” recommendation shall be submitted to the Engineer’s Quality Manager for verification and approval.

Agreed remedial action shall be instituted prior to the initiation of any further activities that may render a non-conforming item inaccessible or difficult to repair.

The Contractor shall provide sufficient photographic evidence of repair work carried out to enable the Engineer to review the closing of all NCRs.

The Engineer, at his sole discretion, may instruct the Contractor to submit official Inspection and Test Requests to verify repair process and activities.

The repair method shall be furnished to the Engineer for approval before the Contractor proceeds to carry out repair works.

The Contractor shall evaluate each deficiency for potential corrective action to prevent recurrence of the problem and shall implement corrective action.

The times within which non-conformances are to be recorded and the relevant NCRs raised, containment action agreed and implemented and corrective action agreed and implemented are to be agreed with the Engineer.

Where the Engineer identifies a non-conformance in a work item, he may either itself raise an NCR or instruct the Contractor to raise an NCR.

All Non-conformance Reports (NCR) raised shall be closed before the Engineer issues a Taking-Over Certificate for the entire Works or a designated Section thereof.

The Contractor shall be responsible for identifying the root cause of deviations identified in the Non Conformance Reports or Corrective Action Requests (CARs) raised by the Engineer or any other designated authority.

The Contractor shall propose corrective actions in writing to the Engineer and ensure timely closing of the NCRs/CARs.

The Contractor shall maintain a Nonconformity Register to indicate the status of all nonconformities which are identified by the Engineer and the Contractor. The Non Conformity Register shall include also corrective and preventive actions to be taken for each non conformity.

3.10 Breach of Quality Obligations

Breaches of the QMS documentation, or other disregard for the quality policies by an individual, are reasons for the Engineer to exercise his authority to require the removal from the construction works of any person employed by the Contractor of any level.

Once removed, such person shall not be re-employed on the Contract nor allowed on the Works unless written agreement by the Engineer.

Where the Engineer orders a suspension of any defective Works or part thereof, such suspension shall continue until the Contractor has satisfied the Engineer that satisfactory corrective action has been taken to eliminate the defective Works that was the subject of the suspension.

CHAPTER - X

GENERAL CONDITIONS OF CONTRACTS

Indian Railways Standard General Conditions of Contract **July 2014 shall be followed with latest correction slips and amendments issued from Indian Railways** (Copy attached as PDF with this tender document).

Indian Railways Standard General Conditions of Contract July 2014, along with latest correction slips and amendments will form part of the tender/contract documents.

- i) Correction Slip No. 2013/CE-I/CT/0/45/JV New Delhi, Dated 22.09.2014
(copy enclosed in PDF)
- ii) Correction Slip No. 2007/CE-I/CT/18/Pt.19(FTS-8798) New Delhi, Dated 15.10.2014 (copy enclosed in PDF)

GENERAL CONDITIONS OF CONTRACT

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In case, there is an ambiguity in any definition, the decision of BBJ regarding the interpretation shall be final and binding.

Wherever there is conflict in any condition between GCC and special condition mentioned in tender documents. The condition mentioned in special condition of contract will prevail. However Engineer-in-charge's decision in this connection shall be final and binding.

Indian Railways Standard General Conditions of Contract **July 2014** with latest correction slips and amendments are to be read along with this tender document.

CHAPTER - XI

DRAWINGS

(Enclosed Separately)

Note:

1. The attached drawings are for tender purpose only.
2. The Old drawing and revised drawing at Annexure A1 to A6 (as per Corrigendum-1 dated 18.01.2017 received from IRCON) is attached in PDF with this tender document.

CHAPTER - XII

GUIDELINE OF FILLING UP

Of FINANCIAL e-BID

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Bill of Quantity

1. Tenderer Should quote only one percentage for the entire BOQ, In case of any deviation in this regard, the tender shall be summarily rejected.
2. Along with percentage the tenderer should also quote either "above" or "below" or at par" failing which the percentage quoted shall be considered as percentage "below" of total cost as per BOQ.
3. Percentage quoted Above/Below/At par including further discount if any, will be applicable on actually executed quantities subjected to limits as per contract.
4. Where there is a discrepancy between the unit rate and the total amount derived from the multiplication of the unit price & the quantity, the unit rate as quoted will govern.
5. The schedule of BILL OF QUANTITIES (BOQ) shall be read in conjunction with the Instructions to Tenderers, Special conditions of contracts, General Technical Specifications of contract, Construction Methodology, General Condition of contract, Drawings and other documents forming part of the tender documents.
6. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before quoting rates in the Bill of Quantities.
7. The quantities given in the Bill of Quantities are estimated and provisional and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and Verified by the Engineer and valued at the accepted rates, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.
8. The rates and amount tendered in the priced Bill of Quantities shall, include all Constructional Plant, labour, supervision, materials, transportation, erection, maintenance, insurance, profit, taxes and duties, together with general risks, liabilities and obligations set out or implied in the Contract.
9. Payment made under stage payment for the quantities shall be the provisional payment subject to the final measurement of finished product. The items damaged/ lost/ unused/ wasted/ pilferaged during the execution for which stage payment has been made, will be recovered in subsequent running account bill/ final bill.
10. In case of any discrepancy, the Description of Items & Units for USSOR Items shall be as per USSOR 2010 published by Northern Railway Engineering Department with all upto date correction slips.
11. In case of any dispute with reference to above paras decision of BBJ shall be final and binding to the contractor.
12. The rates and amount shall be quoted entirely in INDIAN RUPEE (Rs).
13. Bill of Quantities with rates duly filled in is to be submitted in the format provided online in the name of "Financial/Price Bid".
14. The "Financial Bid" shall be digitally signed by the Authorized Signatory of the bidder & submitted "online" only. The authorized signatory of the bidder must be in possession of Power of Attorney before submitting the digitally signed bid.

Bill of Quantity

SCHEDULE 'A'- Bridge No.2

Sl. NO.	Ref. USSOR/N FR/DSR /NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
A 1	211011	Supplying of all types of structural steel conforming to Fe 410 B of IS:2062, fabrication, assembling, erection / slewing / end launching of steel girders (not requiring traffic block) upto span on sub-structure including provision of trolley refuges, if required complete as per approved drawing including one coat of Zinc chrome primer to 1S:104 & one coat of Zinc Chrome Red Oxide to IS:2074 and painting as per IRS-B-1 on all members (detailed fabrication and erection drawings & launching methodology will be prepared and got approved by the contractor from Railway).	MT	2235.00	109086.71	243808805.86	
		Rate includes fabrication of all the battens, bracings, ties, stiffeners, packing, diaphragm, shop rivets/welding, T.F. bolts, drifts, shop weld, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, all lifts and taxes complete, assembly of girders' on- drifts/bolts, field riveting/welding, assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position, lowering of girder on bearings and bed plates, grouting holes in the bed block for fixing of HD bolts/anchor pins of bed plates, all temporary arrangements. Load testing may be done under Chapter-22. The bearing sets to be provided with the girders will be paid separately as per relevant item separately - Plate Girder/Semi Through Girder					
		Payment Schedule:					
		(i) Supply of steel at site - 50% cost of steel against Bank Guarantee					
		(ii) Fabrication and transportation to site - 60% of item rate duly adjusting already paid against steel.					
		(iii) Erection/Launching - 20%					
		(iv) Completion incl. painting & finishing - 20%					
		This job includes alignment/fixing in position of composite girders (line & level) on the required position on top of pier/abutment cap and fixing of bearings etc.					
		Note:-For operation of metalizing & Painting item (in Sl.no.A2 of schedule A), the rate for this item (i.e. Sl. no. of A1 of schedule A) will be reduced by 2%					

THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED

enIT/DGM(P-V)/Br.no.2,3&61/J&K/2149/3130/R1/54-2017

DATE: 31.07.2017

SI. NO.	Ref. USSOR/NFR/DSR/NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/SAC code
A 1.1	211014	Extra for using steel conforming to Fe 490 of IS:8500 instead of Fe 410	MT	2235.00	1930.20	4314002.89	
A 2	211050	Metalizing of steel work of girder with grit blasting as per IRS- B1-2001 following by one coat of etch primer (as per IS:104) and two coats of aluminium paints (as per IS:2339) with all labour, T&P and material as a complete job. (Please refer note at S. No. A1 above)	Sqm	16250.00	127.66	2074414.81	
A 3	211190	Cleaning of steel work of bridge with grit upto clear span with scrapper and/or wire brushes to remove all rust and loose or perished paints to prepare perfectly clean & dry bare metal surface free from all dirt/foreign material & ready for initial coat of paint. Rate includes cost of labour, consumable, brushes, tools & plants, ladders, scarring, jhoola, hanging scaffolding staging etc.	Sqm	16250.00	28.01	455139.20	
A 4	NFR USSOR Item no. 211141	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast elements complete as per IS:2062, IS:1030, AISI:304, AISI:316, IS:6911, BS:3784, IS:3400, IS:226, BS-5400, Bridge Code and as per drawing and approved Technical Specifications. The design of the bearings shall be submitted by the manufacturers/contractor and got approved from Railway before fixing. Test report of the bearings should be got approved before the materials are lifted from the manufacturer premises. Payment is based on capacity of Bearing. - POT-PTFE Bearing	MT Bearing Capacity	62040.00	725.45	45006637.11	
A5		Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M35 grade (Cast in-Situ) in bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component using 20mm graded crushed stone aggregate and coarse sand of approved quality of cast in-situ RCC box of size upto 5m (bigger inside dimension) including finishing, Admixtures in recommended proportions (as per IS:9103), if approved in Mix design, to accelerate, retard setting of concrete, improve workability without impairing strength and durability, complete as per drawings and technical specifications as directed by Engineer in charge. Payment for cement, reinforcement and shuttering shall be paid extra.					
A5.1	194010	Deck Slab	Cum	2510.00	3322.48	8339424.10	
A5.2	33062	OPC 53 GRADE	Tonn	1060.00	8778.47	9305178.90	

SI. NO.	Ref. USSOR/N FR/DSR /NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
A5.3	195038	Centring and shuttering including strutting, propping etc. and removal of form for Bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component	Sqm	12177.00	317.75	3869182.97	
A6		Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M35 grade (Cast in-Situ) using 20mm graded crushed stone aggregate and coarse sand of approved quality for the following Reinforced cement concrete structural lements,including finishing, using Admixtures in recommend-ed proportions (as per IS:9103), if approved in Mix design to accelerate or retard setting of concrete and/or improve workability without impairing strength and durability complete as per specifications and direction of the Engineer in charge. Payment for cement, reinforcement & shuttering shall to be paid. Concrete cross beam at piers and abutments.					
A6.1	192063	Concrete cross beam at pier and abutment location.	Cum	620.00	2917.27	1808704.34	
A6.2	33062	OPC 53 GRADE	Tonn	310.00	8778.47	2721325.91	
A6.3	195033	Centring and shuttering including strutting, propping etc. and removal of form for Abutment cap, pier cap,inspection platform & pedestal over pier cap,fender wall,diaphragm wall etc.	Sqm	1600.00	308.39	493417.34	
A7		Providing and laying Design Mix Cement Concrete M35 grade (Cast in-Situ) as per IRS concrete bridge code using using 12.5 mm graded crushed stone aggregate and coarse sand of approved quality in 50mm thick wearing coat on deck slab including machine, batching machine, mixing machine vibrating, curing centering, shuttering including strutting and Propping, removal of formwork, scaffolding , tools and plant, equipments ,machinery, all leads, lift, with all materials and labour complete as per drawings and technical specification or as directed by engineer-in-charge					
A7.1	194010	Protective concrete for Deck Slab	Cum	279.00	3322.48	926971.84	
A7.2	33062	OPC 53 GRADE	Tonn	118.00	8778.47	1035859.54	

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DATE: 31.07.2017

SI. NO.	Ref. USSOR/N FR/DSR /NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
A7.3	195038	Centring and shuttering including strutting, propping etc. and removal of form for Abutment & pier, Abutment/piercaps, Return wall, dirt wall, approach slab, inspection platform etc.	Sqm	35.00	317.75	11121.08	
A8	43019	Providing, hoisting and laying in mortar bed in position M25 Grade Reinforced Cement Concrete in precast for edge beam, including the cost of centring, shuttering, finishing, Admixtures in recommended proportion (as per Is 9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, including the mortar bed but excluding the cost of cement for precast element and steel reinforcement, as per approved plan & as per direction of the Engineer in charge. Pre cast element Edge Beam	Cum	610.00	7696.86	4695082.63	
A8.1	33062	Supply and using cement at worksite OPC 43 grade	Tonn	255.00	8035.67	2049095.18	
A9	43019	Providing, hoisting and laying in position, M25 Grade concrete in precast for cable duct, including the cost of centring, shuttering, finishing, Admixtures in recommended proportion (as per Is 9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, but excluding the cost of cement for precast element and steel reinforcement, as per approved plan & as per direction of the Engineer in charge.	Cum	133.50	7696.86	1027530.38	
A9.1	33062	Supply and using cement at worksite OPC 43 grade	Tonn	50.00	8035.67	401783.37	
A10	45016	Supplying of Reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete. Thermo-Mechanically Treated bars	Kg	674611.00	79.07	53340349.99	
A11	DSR 2014 Item 10.25.2	Steel work welded in built up sections / framed work for railing of inspection slab as per design / drawing including cutting hoisting, grouting fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.	Kg	120120.00	113.84	13674398.04	
A12	NP-1	Supply & fixing 150mm dia GI pipe of approved brand and quality confirming to IS: 4985 of min 2.5 kgf/sq cm, of variable lengths in abutments, wings/ return walls, retaining walls, boxes, walls of drains, any type of wall as weep holes as per drawing, or at any other location as per the instructions of Engineer-in-Charge with all contractors labour, tools and plant, material, lead and lift arrangement for dewatering, machinery as complete job as per specifications and as directed by Engineer-in-charge.	RM	220.00	1178.73	259321.55	

SI. NO.	Ref. USSOR/N FR/DSR /NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
A13	NP-2	Providing, manufacturing and installation of longitudinal movement joint as shown on the drawings. This includes all materials (steel plates, angles, anchor bolts, shear studs, nuts, washers, synthetic plate and gluing material etc.), auxiliary materials, auxiliary equipment, work, labour etc. to manufacture, transport and install the movement joint as a complete job. Testing of used materials shall be according to the relevant standards. Payment shall be per weight of steel of installed joint. All materials and works as described above are included in the rate. Movement Joint	Kg	20650.00	253.70	5238941.91	
A14	201051	Providing and fixing in position of standard preformed sealed and slab type or strip seal elastomeric type expansion joints for Railway bridge or Road Over Bridges as per approved drawings and latest MOST / IRC specifications. The rates are inclusive of supplying, fixing with contractor's own materials, e.g. inserts, bolts, socket tubes, Neoprene sheet/cap etc., equipments, machineries, labour, all taxes, royalty, all lead & lifts, transport, testing, surface preparations, complete. - For 80mm expansion	RM	165.00	61749.25	10188626.50	
TOTAL COST OF SCHEDULE 'A'						41,50,45,315.44	

Bill of Quantity

SCHEDULE 'B'- Bridge No. 3

Sl. NO.	USSOR/ NFR/DSR /NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
B1	211011	Supplying of all types of structural steel conforming to Fe 410 B of IS:2062, fabrication, assembling, erection / slewing / end launching of steel girders (not requiring traffic block) upto span on sub-structure including provision of trolley refuges, if required complete as per approved drawing including one coat of Zinc chrome primer to 1S:104 & one coat of Zinc Chrome Red Oxide to IS:2074 and painting as per IRS-B-1 on all members (detailed fabrication and erection drawings & launching methodology will be prepared and got approved by the contractor from Railway).	MT	1624.00	109086.71	177156823.58	
		Rate includes fabrication of all the battens, bracings, ties, stiffeners, packing, diaphragm, shop rivets/welding, T.F. bolts, drifts, shop weld, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, all lifts and taxes complete, assembly of girders' on- drifts/bolts, field riveting/welding, assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position, lowering of girder on bearings and bed plates, grouting holes in the bed block for fixing of HD bolts/anchor pins of bed plates, all temporary arrangements. Load testing may be done under Chapter-22. The bearing sets to be provided with the girders will be paid separately as per relevant item separately - Plate Girder/Semi Through Girder					
		Payment Schedule:					
		(i) Supply of steel at site - 50% cost of steel against Bank Guarantee					
		(ii) Fabrication and transportation to site - 60% of item rate duly adjusting already paid against steel.					
		(iii) Erection/Launching - 20%					
		(iv) Completion incl. painting & finishing - 20%					
		This job includes alignment/fixing in position of composite girders (line & level) on the required position on top of pier/abutment cap and fixing of bearings etc.					
		Note:-For operation of metalizing & Painting item (in Sl.no.B2 of schedule B), the rate for this item (i.e. Sl. no. of B1 of schedule B) will be reduced by 2%					

THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED

enIT/DGM(P-V)/Br.no.2,3&61/J&K/2149/3130/R1/54-2017

DATE: 31.07.2017

SI. NO.	USSOR/ NFR/ DSR/NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
B 1.1	211014	Extra for using steel conforming to Fe 490 of IS:8500 instead of Fe 410	MT	1624.00	1930.20	3134649.08	
B 2	211050	Metalizing of steel work of girder with grit blasting as per IRS- B1-2001 following by one coat of etch primer (as per IS:104) and two coats of aluminium paints (as per IS:2339) with all labour, T&P and material as a complete job. (Please refer note at SL. No. B1 above)	Sqm	11800.00	127.66	1506344.30	
B 3	211190	Cleaning of steel work of bridge with grit upto clear span with scrapper and/or wire brushes to remove all rust and loose or perished paints to prepare perfectly clean & dry bare metal surface free from all dirt/ foreign material & ready for initial coat of paint. Rate includes cost of labour, consumable, brushes, tools & plants, ladders, scarring, jhoola, hanging scaffolding staging etc.	Sqm	11800.00	28.01	330501.08	
B 4	NFR USSOR Item no. 211141	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by disc. or un reinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel / fabricated structural steel, metal and elastomer elements complete as per IS:2062, IS:1030, AISI:304, AISI:316, IS:6911, BS:3784, IS:3400, IS:226, BS-5400, Bridge Code and as per drawing and approved Technical Specifications. The design of the bearings shall be submitted by manufacturers/ contractor and got approved from Railway before fixing. Test report of the bearings should be got approved before the materials are lifted from the manufacturer premises. Payment is based on capacity of Bearing. - POT-PTFE Bearing	MT Bearing Capacity	45120.00	725.45	32732099.72	
B5		Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M35 grade (Cast in-Situ) in bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component using 20mm graded crushed stone aggregate and coarse sand of approved quality of cast in-situ RCC box of size upto 5m (bigger inside dimension) including finishing, Admixtures in recommended proportions (as per IS:9103), if approved in Mix design, to accelerate, retard setting of concrete, improve workability without impairing strength and durability, complete as per drawings and technical specifications as directed by Engineer in charge. Payment for cement, reinforcement and shuttering shall be paid extra.					

SI. NO.	USSOR/ NFR/ DSR/NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
B 5.1	194010	Deck Slab	Cum	1826.00	3322.48	6066847.97	
B 5.2	33062	OPC 53 GRADE	Tonn	771.00	8778.47	6768200.88	
B 5.3	195038	Centring and shuttering including strutting, propping etc. and removal of form for Bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component	Sqm	8856.00	317.75	2813951.25	
B 6		Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M35 grade (Cast in-Situ) using 20mm graded crushed stone aggregate and coarse sand of approved quality for the following Reinforced cement concrete structural lements,including finishing, using Admixtures in recommend-ed proportions (as per IS:9103), if approved in Mix design to accelerate or retard setting of concrete and/or improve workability without impairing strength and durability complete as per specifications and direction of the Engineer in charge. Payment for cement, reinforcement & shuttering shall be paid. Concrete cross beam at piers and abutments.					
B6.1	192063	Concrete cross beam at pier and abutment location.	Cum	450.00	2917.27	1312769.28	
B6.2	33062	OPC 53 GRADE	Tonn	225.00	8778.47	1975155.90	
B6.3	195033	Centring and shuttering including strutting, propping etc. and removal of form for Abutment cap, pier cap, inspection platform & pedestal over pier cap, Fender wall, Diaphragm wall etc.	Sqm	1160.00	308.39	357727.57	
B7		Providing and laying Design Mix Cement Concrete M35 grade (Cast in-Situ) as per IRS concrete bridge code using using 12.5 mm graded crushed stone aggregate and coarse sand of approved quality in 50mm thick wearing coat on deck slab including machine, batching machine, mixing machine vibrating, curing centering, shuttering including strutting and Propping, removal of formwork, scaffolding, tools and plant, equipments, machinery, all leads, lift, with all materials and labour complete as per drawings and technical specification or as directed by engineer-in-charge.					
B7.1	194010	Protective concrete for Deck Slab	Cum	203.00	3322.48	674463.38	
B7.2	33062	OPC 53 GRADE	Tonn	86.00	8778.47	754948.48	
B7.3	195038	Centring and shuttering including strutting, propping etc. and removal of form for Abutment & pier, Abutment/piercaps, Return wall, dirt wall, box approach slab, inspection platform etc.	Sqm	10.00	317.75	3177.45	

SI. NO.	USSOR/ NFR/ DSR/NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
B8	43019	Providing, hoisting and laying in mortar bed in position M25 Grade Reinforced Cement Concrete in precast for edge beam, including the cost of centring, shuttering, finishing, Admixtures in recommended proportion (as per Is 9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, including the mortar bed but excluding the cost of cement for precast element and steel reinforcement, as per approved plan & as per direction of the Engineer in charge. Pre cast element Edge Beam	Cum	444.00	7696.86	3417404.40	
B8.1	33062	Supply and using cement at worksite OPC 43 grade	Tonn	192.00	8035.67	1542848.14	
B 9	43019	Providing, hoisting and laying in position, M25 Grade concrete in precast for cable duct, including the cost of centring, shuttering, finishing, Admixtures in recommended proportion (as per Is 9103) to accelerate, retard setting of concrete, improve workability without impairing strength and durability, but excluding the cost of cement for precast element and steel reinforcement, as per approved plan & as per direction of the Engineer in charge.	Cum	69.60	7696.86	535701.23	
B 9.1	33062	Supply and using cement at worksite OPC 43 grade	Tonn	30.00	8035.67	241070.02	
B10	45016	Supplying of Reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete. Thermo-Mechanically Treated bars	Kg	490665.00	79.07	38796051.10	
B11	DSR 2014 Item 10.25.2	Steel work welded in built up sections / framed work for railing of inspection slab as per design/ drawing including cutting hoisting, grouting fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.	Kg	87360.00	113.84	9945016.75	
B 12	NP-1	Supply & fixing 150mm dia GI pipe of approved brand and quality confirming to IS: 4985 of min 2.5 kgf/sq. cm, of variable lengths in abutments, wings/ return walls, retaining walls, boxes, walls of drains, any type of wall as weep holes as per drawing, or at any other location as per the instructions of Engineer-in-Charge with all contractors labour, tools and plant, material, lead and lift arrangement for dewatering, machinery as complete job as per specifications and as directed by Engineer-in-charge.	RM	160.00	1178.73	188597.49	

SI. NO.	USSOR/ NFR/ DSR/NP Items	Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
B13	NP-2	Providing, manufacturing and installation of longitudinal movement joint as shown on the drawings. This includes all materials (steel plates, angles, anchor bolts, shear studs, nuts, washers, synthetic plate andgluing material etc.), auxiliary materials, auxiliary equipment, work, labour etc. to manufacture, transport and install the movement joint as a complete job. Testing of used materials shall be according the relevant standards. Payment shall be per weight of steel of installed joint. All materials and works asdescribed above are included in the rate. Movement Joint	Kg	15015.00	253.70	3809332.34	
B14	201051	Providing and fixing in position of standard preformed sealed and slab type or strip seal elastomeric type expansion joints for Railway bridge or Road Over Bridges as per approved drawings and latest MOST/ IRC speci-fications. The rates are inclusive of supplying, fixing with contractor's own materials, e.g. inserts, bolts, socket tubes, Neoprene sheet /cap etc.,equipments, machineries, labour, all taxes, royalty, all lead & lifts, transport, test-ing, surface preparations, complete - For 80mm expansion	RM	124.00	61749.25	7656907.19	
TOTAL COST OF SCHEDULE 'B'						30,17,20,588.59	

Bill of Quantity

SCHEDULE 'C'- Bridge No. 61

SI NO.	USSOR/ NFR/DSR/ NP Items	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
C 1	211011	Supplying of all types of structural steel conforming to Fe 410 B of IS:2062, fabrication, assembling, erection / slewing / end launching of steel girders (not requiring traffic block) upto span on sub-structure including provision of trolley refuges, if required complete as per approved drawing including one coat of Zinc chrome primer to 1S:104 & one coat of Zinc Chrome Red Oxide to IS:2074 and painting as per IRS-B-1 on all members (detailed fabrication and erection drawings & launching methodology will be prepared and got approved by the contractor from Railway).	MT	470.00	109086.71	51270755.59	
		Rate includes fabrication of all the battens, bracings, ties, stiffeners, packing, diaphragm, shop rivets/ welding, T.F. bolts, drifts, shop weld, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, all lifts and taxes complete, assembly of girders' on- drifts/bolts, field riveting/welding, assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position, lowering of girder on bearings and bed plates, grouting holes in the bed block for fixing of HD bolts/anchor pins of bed plates, all temporary arrangements. Load testing may be done under Chapter-22. The bearing sets to be provided with the girders will be paid separately as per relevant item separately - Plate Girder/Semi Through Girder					
		Payment Schedule:					
		(i) Supply of steel at site - 50% cost of steel against Bank Guarantee					
		(ii) Fabrication and transportation to site - 60% of item rate duly adjusting already paid against steel.					
		(iii) Erection / Launching - 20%					
		(iv) Completion incl. painting & finishing - 20%					
		This job includes alignment/fixing in position of composite girders (line & level) on the required position on top of pier/abutment cap and fixing of bearings etc.					
		Note:-For operation of metalizing & Painting item (in Sl.no.C2 of schedule C), the rate for this item (i.e. Sl. no. of C1 of schedule C) will be reduced by 2%					

THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED

eNIT/DGM(P-V)/Br.no.2,3&61/J&K/2149/3130/R1/54-2017

DATE: 31.07.2017

SI NO.	USSOR/NFR/DS R/NP Items	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	HSN/SAC code
C 1.1	211014	Extra for using steel conforming to Fe 490 of IS:8500 instead of Fe 410	MT	470.00	1930.20	907195.24	
C 2	211050	Metalizing of steel work of girder with grit blasting as per IRS- B1-2001 following by one coat of etch primer (as per IS:104) and two coats of aluminium paints (as per IS:2339) with all labour, T&P and material as a complete job. (Please refer note at SL. No. C1 above)	Sqm	800.00	127.66	102125.04	
C 3	211190	Cleaning of steel work of bridge with grit upto clear span with scrapper and/or wire brushes to remove all rust and loose or perished paints to prepare perfectly clean & dry bare metal surface free from all dirt/ foreign material & ready for initial coat of paint. Rate includes cost of labour, consumable, brushes, tools & plants, ladders, scarring, jhoola, hanging scaffolding staging etc.	Sqm	800.00	28.01	22406.85	
C 4	NFR USSOR Item no. 211141	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by disc. or un reinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel / fabricated structural steel, metal and elastomer elements complete as per IS:2062, IS:1030, AISI:304, AISI:316, IS:6911, BS:3784, IS:3400, IS:226, BS-5400, Bridge Code and as per drawing and approved Technical Specifications. The design of the Bearings shall be submitted by manufacturers/ contractor and got approved from Railway before fixing. Test report of the bearings should be got approved before the materials are lifted from the manufacturer premises. Payment is based on capacity of Bearing. - POT-PTFE Bearing	MT Bearing Capacity	2000.00	725.45	1450890.95	
C5		Providing and laying in position machine mixed, machine vibrated and machine batched Design Mix Cement Concrete M40 grade (Cast in-Situ) in bottom/ top slab, side walls, toe wall and sumps haunch filling head walls or any other component using 20mm graded crushed stone aggregate and coarse sand of approved quality of cast in-situ RCC box of size upto 5m (bigger inside dimension) including finishing, Admixtures in recommended proportions (as per IS:9103), if approved in Mix design, to accelerate, retard setting of concrete, improve workability without impairing strength and durability, complete as per drawings and technical specifications as directed by Engineer in charge. Payment for cement, reinforcement and shuttering shall be paid extra.					

SI NO.	USSOR/ NFR/DSR/ NP Items	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
C 5.1	194010	Deck Slab	Cum	206.00	3322.48	684430.82	
C 5.2	33062	OPC 53 GRADE	Tonn	89.00	8778.47	781283.89	
C 5.3	195038	Centring and shuttering including strutting, propping etc. and removal of form for Bottom/top slab, side walls, toe wall and sumps haunch filling head walls or any other component	Sqm	882.00	317.75	280251.24	
C 6		Providing and laying Design Mix Cement Concrete M35 grade (Cast in-Situ) as per IRS concrete bridge code using 12.5mm graded crushed stone aggregate and coarse sand of approved quality in 50mm thick wearing cost coat on deck slab including machine batching, machine mixing, machine vibrating, curing centering, shuttering including strutting and propping, removal of formwork, scaffolding, tools and plant, equipments, machinery, all leads, lift, with all materials and labour complete as per drawings and technical specification or as directed by engineer-in-charge.					
C 6.1	192063	Protective concrete for Deck Slab	Cum	42.00	3322.48	139544.15	
C 6.2	33062	OPC 53 GRADE	Tonn	19.00	8778.47	166790.94	
C 6.3	195033	Centring and shuttering including strutting, propping etc. and removal of form for Abutment & pier /Abutment & piercaps, Return wall, dirt wall, approach slab, inspection platform etc.	Sqm	10.00	317.75	3177.45	
C 7	45016	Supplying of Reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete. Thermo-Mechanically Treated bars	Kg	375000.00	79.07	29650615.31	
C 8	DSR 2014 Item 10.25.2	Steel work welded in built up sections / framed work for railing of inspection slab as per design/ drawing including cutting hoisting, grouting fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.	Kg	25000.00	113.84	2845986.94	
C 9	NP-1	Supply & fixing 150mm dia GI pipe of approved brand and quality confirming to IS: 4985 of min 2.5 kgf/sq cm, of variable lengths in abutments, wings/return walls, retaining walls, boxes, walls of drains, any type of wall as weep holes as per drawing, or at any other location as per the instructions of Engineer-in-Charge with all contractors labour, tools and plant, material, lead and lift arrangement for dewatering, machinery as complete job as per specifications and as directed by Engineer-in-charge.	RM	60.00	1178.73	70724.06	

SI NO.	USSOR/ NFR/DSR/ NP Items	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	HSN/ SAC code
C 10	201051	Providing and fixing in position of standard preformed sealed and slab type or strip seal elastomeric type expansion joints for Railway bridge or Road Over Bridges as per approved drawings and latest MOST/ IRC specifications. The rates are inclusive of supplying, fixing with contractor's own materials, e.g. inserts, bolts, socket tubes, Neoprene sheet/cap etc., equipments, machineries, labour, all taxes, royalty, all lead & lifts, transport, testing, surface preparations, complete. - For 80mm expansion	RM	36.00	61749.25	2222973.05	
TOTAL COST OF SCHEDULE 'C'						9,05,99,151.53	