दी ब्रेथवेट बर्न एंड जेसप कंस्ट्रक्शन कंपनी लिमिटेड
The Braithwaite Burn And Jessop Construction Company Limited
(भारत सरकार का एक उद्यम) / (A Government of India Enterprise)

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

Registered Office: 27, Rajendra Nath Mukherjee Road,
Kolkata – 700 001, West Bengal.
Phone: (033) 2248 5841-44 Fax: 033-2210 3961
Email: info.bbjconst@bbjconst.com; Website: www.bbjconst.com;

e-Tender No.	**eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024**	**Date:**	**24th Oct. 2024**

NOTICE INVITING e-TENDER.

Sealed Tenders under a **two-bid system** (i.e., "Techno-Commercial & Price Part") are invited from eligible bidders for carrying out Re-Girdering Work and other miscellaneous works as detailed in **"Scope of Work"**/ **"BOQ",** hereunder:

01	NAME OF WORK	**SUPPLY, FABRICATION, ERECTION AND RE-GIRDERING** OF BR NO. 624UP, 655UP, 701 UP, 784DN, 836UP, 929 UP OF R-V LINE AND BR.NO.1205, 890 DN OF KK -LINE WITH RDSO/ APPROVED DRAWINGS TO SUIT 25T AXLE LOAD IN VIEW OF MISSION 3000 MT AND OTHER MISCELLANEOUS WORKS SUCH AS FABRICATION AND SUPPLY OF CC CRIBS ETC IN WALTAIR DIVISION.
02	SCOPE OF WORK	AS PER NIT/ BOQ
03	COST PUT TO TENDER/ BASIC COST	**RS. 34,02,34,253.89 INCLUDING GST.**
04	COMPLETION PERIOD	**15 (FIFTEEN) MONTHS** FOR ENTIRE WORK FROM THE DATE OF LETTER OF ACCEPTANCE (LOA) OR WORK ORDER, WHICHEVER IS EARLIER. TIME OF COMPLETION WILL BE REDUCED SUITABLY IN CASE THE JOB IS DISTRIBUTED BETWEEN TWO OR MORE SUBCONTRACTORS.
05	COST OF TENDER DOCUMENT (NON-REFUNDABLE)	**RS.10,000/- (RUPEES TEN THOUSAND ONLY)** BY NEFT/ RTGS/ DEMAND DRAFT/ PAY ORDER/ BANKER'S CHEQUE IN FAVOUR OF "THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED" PAYABLE AT "KOLKATA". **TENDER DOCUMENTS WITHOUT THE TENDER FEE SHALL BE REJECTED.** EXEMPTION FOR MICRO AND SMALL ENTERPRISES (MSE) FOR SUBMISSION OF "TENDER FEE" IS "**NOT APPLICABLE**" SINCE WORKS CONTRACT ARE EXCLUDED FROM THE PURVIEW OF PUBLIC PROCUREMENT POLICY FOR MSE ORDER, 2012 AND ITS LATEST AMENDMENT(S).
06	EARNEST MONEY	**RS.20,00,000/- (RUPEES TWENTY LAKH ONLY)** BY NEFT/ RTGS/ DEMAND DRAFT/ PAY ORDER/ BANKER'S CHEQUE IN FAVOUR OF "THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED" PAYABLE AT "KOLKATA". **TENDER DOCUMENTS WITHOUT EMD SHALL STRAIGHTWAY BE REJECTED.**

		FOR UNSUCCESSFUL BIDDERS, EMD WILL BE REFUNDED AFTER THE FINALIZATION OF THE ORDER, WITHOUT ANY INTEREST. FOR SUCCESSFUL BIDDER, THE ABOVE EMD AMOUNT WILL BE CONVERTED INTO A SECURITY DEPOSIT AND WILL BE RETAINED BY BBJ TILL SUCCESSFUL COMPLETION OF THE DEFECT LIABILITY PERIOD. EXEMPTION FOR MICRO AND SMALL ENTERPRISES (MSE) FOR SUBMISSION OF "EARNEST MONEY" IS "**NOT APPLICABLE**" SINCE WORKS CONTRACT ARE EXCLUDED FROM THE PURVIEW OF PUBLIC PROCUREMENT POLICY FOR MSE ORDER, 2012 AND ITS LATEST AMENDMENT(S).	
07	MODE OF SUBMISSION	ONLINE THROUGH THE E-PROCUREMENT SYSTEM OF CPPP (CENTRAL PUBLIC PROCUREMENT PORTAL). **A HARD COPY OF THE BID, AS UPLOADED, (TECHNO-COMMERCIAL) SHALL HAVE TO BE SUBMITTED TO BBJ-HO BEFORE OPENING OF TECHNICAL BID.** TO BBJ'S OFFICE BEFORE OPENING OF TECHNICAL BID. CORRIGENDUM, IF ANY, WILL BE PUBLISHED ON CPPP AND BBJ'S WEBSITE.	
08	DATE & TIME SCHEDULE:	Date of Publishing NIT & Tender Documents	**24/10/2024**
		Document download Start Date	**24/10/2024 - 10:00 HRS**
		Start Date of uploading of bid document	**31/10/2024 - 10:00 HRS**
		End Date for uploading of bid document	**06/11/2024 - 15:00 HRS**
		Date of opening of Technical Bid	**07/11/2024 - 15:00 HRS**
		Date of opening of Financial Bid	**To be notified later**

SOUVIK BHATTACHARYA
Digitally signed by SOUVIK BHATTACHARYA
Date: 2024.10.23 16:14:44 +05'30'

(पार्थ नंदी / PARTHA NANDY)
मुख्य प्रबंधक (परियोजना) / CHIEF MANAGER (PROJECT)

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

INSTRUCTION TO BIDDERS

1. **REGISTRATION OF CONTRACTOR**
Any bidder 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. **DIGITAL SIGNATURE CERTIFICATE (DSC)**
Each bidder 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 the requisite amount. Details are available at the web Site (https://eprocure.gov.in/eprocure/app) in Clause 2 of Guideline to the bidder. DSC is given as a USB e-Token.

3. **SUBMISSION OF TENDER: ONLINE MODE IN CPPP'S PORTAL**
Bids are to be submitted online through the e-Procurement system of **Central Public Procurement Portal (CPPP) (https://eprocure.gov.in/eprocure/app)**. Hardcopy of the uploaded/ submitted bid shall have to be submitted to our office physically along with the EMD, Tender cost & all other documents. Tender document to be digitally signed with Company's seal by the bidders. The rates in the appropriate space in the Bill of Quantity should be properly filled in.

4. **LANGUAGE**
Bids and all accompanying documents shall be in English. In case any accompanying documents are in another language, they shall be accompanied by an English translation. The English version shall prevail in the matter of interpretation.

5. **SUBMISSION OF BID**

a. All the pages of the Tender document are to be signed with Company's seal by the bidders. The rates in the appropriate space in the **BILL OF QUANTITY** of the tender should be properly filled.

b. The Tender shall be signed by the person legally authorized to enter into a commitment on behalf of the tenderer. Tenders are to be submitted in two parts as per following:

c. Scanned copy of the EMD, Cost of Tender and other documents, as stated below, are to be uploaded in CPP's portal and a hard copy of the same to be sent addressed to GM(P&P) at BBJ's Head office in a sealed envelope, super scribing "TENDER NOTICE NO." & "FEE PART":

i) **Earnest Money Deposit (EMD) of Rs.20,00,000/-** (Rupees twenty lakh only) in the form of NEFT/ RTGS/ Demand Draft/ Pay Order from any Nationalised or Schedule Bank drew in favour of "The Braithwaite Burn and Jessop Construction Company Limited" payable at "Kolkata". In the case of a successful bidder, this EMD will be converted to Security Deposit and will be retained by BBJ till the completion of the entire job, without any interest.

ii) **Cost of Tender (Non-Refundable) of Rs.10,000/-** (Rupees ten thousand five hundred only) in the form of NEFT/ RTGS/ Demand Draft/ Pay Order from any Nationalised or schedule Bank drawn in favour of "The Braithwaite Burn and Jessop Construction Company Limited" payable at "Kolkata".

Bank Details for NEFT/ RTGS:

Name of Beneficiary:	THE BRAITHWAITE BURN AND JESSOP CONSTRUCTION COMPANY LIMITED.
Bank Name:	STATE BANK OF INDIA

Branch:	DALHOUSIE SQUARE (CALCUTTA)
Bank Address:	2, B.B.D. BAGH (EAST), KOLKATA – 700001 (W.B.).
Bank Account No.:	11175160292
Bank Account Type:	Current
IFS Code:	SBIN0001401

PS: In the case of EMD & Tender Fee submitted through NEFT/ RTGS, necessary documents need to be uploaded in CPP Portal and submitted along with the bid.

d. TECHNO-COMMERCIAL PART:

Scanned copy of the EMD, Cost of Tender and other documents, as stated below, are to be uploaded in CPPP's portal and a hard copy of the same to be addressed to the Chief Manager (Project) at BBJ's Head office in a sealed envelope, super scribing "TENDER NOTICE NO." and "TECHNO-COMMERCIAL PART":

i) Signed copies of documents as per Eligibility Criteria.
ii) Signed copy of **PAN, Goods & Service Tax (GST) registration certificates**.
iii) Signed copy of **Provident Fund & Employees State Insurance (ESI) Registration Certificate**.
iv) Company's audited Balance Sheet & Profit & Loss Account for last 3 (three) financial years ending as on 31st March 2024.
v) Downloaded Tender document (without quoting any price in Techno-Commercial Bid) duly signed with an official stamp on each page.
vi) **Solvency Certificate** (as per attached format) for at least **40%** of the advertised value of the tender.
vii) Any Bidder falling under Micro and Small Enterprises (MSEs) category, shall furnish the following details & submit documentary evidence/ Govt. Certificate etc. in support of the same along with their techno-commercial offer:

Type under MSE	SC/ST Owned	Women Owned	Others (excluding SC/ ST & Women Owned)
Micro			
Small			

Note: - If the bidder does not furnish the above, the offer shall be processed construing that the bidder is not falling under MSE category.

e. PRICE PART:

Properly filled up **BILL OF QUANTITIES (BOQ)** is to be uploaded to CPPP's website. Price bid of only those bidders will be opened whose Techno-commercial offers are found to be qualified and acceptable to BBJ.

f. The above 'TECHNO-COMMERCIAL PART' shall have to be forwarded to Chief Manager (Project) at BBJ's Head office.

6. **INTEGRITY PACT:**

The Bidder/ Contractor is required to enter into an Integrity Pact with BBJ, in the Format at Annexure-I. The Integrity Pact enclosed at Annexure-I will be signed by BBJ for and on behalf of Employer as its Agent / Power of Attorney Holder at the time of execution of Agreement with the successful Bidder. While submitting the Bid, the Integrity Pact shall be signed by the duly authorized signatory of the Bidder. In case of failure to submit the Integrity Pact duly signed and witnessed, along with the Bid, the Bid is likely to be rejected.

In case of any contradiction between the Terms and Conditions of the Bid Document and the Integrity Pact, the former will prevail. For monitoring of the Integrity Pact, BBJ has appointed the following eminent personality as Independent External Monitor(s) (IEM):

Shri Sunil Pandey **IFoS (Retd.)** 249, Phase-I, Vasant Vihar, Dehradun – 248001. Uttarakhand Email: pandey.sunil90@yahoo.co.in	**Dr. Ravindra Kumar Srivastava** **IAS (Retd.)** A6, Anand Niketan, New Delhi - 110021 Email: srivastava.rks@gmail.com

7. All costs and expenses incidental to the preparation of the tender, discussion, conference, pre-award discussion with BBJ shall be to the account of the bidder and BBJ shall bear no liability whatsoever on such cost expenses.

8. **Works Contract are excluded from the purview of Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012.**

9. **No deviation to the tender conditions shall be accepted. Conditional tenders shall not be accepted, and no additional clause shall be entertained. All rights reserved upon BBJ in this regard.**

10. The award of the order or rejection of the Tenderer's offer and/or cancellation of the tender will be made at the absolute discretion of BBJ. BBJ reserves the right to cancel or accept or reject any or all tender(s), whether lowest or otherwise, without assigning any reason(s) whatsoever thereof. A tenderer, whose tender is not accepted shall not be entitled to claim any cost, charges or expenses incidental to or incurred by him through or in connection with the preparation and submission of the Tender/ Offer to BBJ.

11. **CURRENCIES OF BID AND PAYMENT**
The tenderer shall submit his price bid/ offer in Indian Rupees and payment under this contract will be made in Indian Rupees.

12. Firm price order: Price shall remain firm till completion of work as per order including modification thereof and no claim for variation in quantities, labour & materials prices etc. will be entertained.

13. All duties, taxes, fees and other levies except GST payable by the successful bidder under the contract or any other cause shall be included in the quoted prices.

14. **PREFERENCE TO MAKE IN INDIA:**
The provisions of revised 'Public Procurement (Preference to Make in India) Order 2017' issued by Department of Industrial Policy and Promotion under Ministry of Commerce and Industry vide letter no. P45021/2/2017-PP (BE-II) dated 16th September 2020, as amended from time to time up to Bid Due Date, shall be applicable to the bidding process and award of the contract shall be done accordingly.

Please enter the percentage of local content in the material being offered. Please enter 0 for fully imported items, and 100 for fully indigenous items. The definition and calculation of local content shall be in accordance with the Make in India policy as incorporated in the tender conditions.

15. **PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA):**
For this procurement, the local content to categorize a supplier as a Class I local supplier/ Class II local Supplier/Non-Local Supplier and purchase preferences to Class I local supplier,

is as defined in Public Procurement (Preference to Make in India), Order 2017 dated 4th June 2020 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT.

16. **COMPLIANCE TO RESTRICTIONS UNDER RULE 144 (XI) OF GFR 2017**

I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. The Competent Authority for the purpose of this Clause shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT).

II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III. "Bidder from a country which shares a land border with India" for the purpose of this Clause means:
   a) An entity incorporated established or registered in such a country; or
   b) A subsidiary of an entity incorporated established or registered in such a country; or
   c) An entity substantially controlled through entities incorporated, established or registered in such a country; or
   d) An entity whose beneficial owner is situated in such a country; or
   e) An Indian (or other) agent of such an entity; or
   f) A natural person who is a citizen of such a country; or
   g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

IV. The beneficial owner for the purpose of (III) above will be as under:

17. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation-
a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent of shares or capital or profits of the company.
b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements.

18. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership.

19. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person has ownership of or entitlement to more than fifteen percent of the property or capital or profits of the such association or body of individuals.

20. Where no natural person is identified under (19) or (20) or (21) above, the beneficial owner is the relevant natural person who holds the position of senior managing official.

21. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

22. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

Note:
i. The bidder shall provide undertaking for their compliance to this Clause, in the format provided in Annexure-A.
ii. Registration of the bidder with Competent Authority should be valid at the time of submission of bids and at the time of acceptance of the bids.

23. **VALIDITY OF TENDER**
90 (ninety) days from the date of opening of tender or for a further period if mutually accepted. BBJ reserves the right to ask for the extension of validity if any.

24. **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) Work order
2) Letter of Award (LOA)
3) Schedule of Items, Rates & Quantities
4) Special Conditions of the Contract (SCC)
5) Technical Specifications (TS)
6) Scope of Work (SOW)
7) Drawings
8) Relevant Codes & Standards
9) Notice Inviting Tender
10) Instructions to the Bidders (IB)
11) General Conditions of Contract
12) Any other documents forming part of the Contract.

25. **Bidder should submit the documents in Hard Copy on or before as stipulated in "DATE & TIME SCHEDULE" to the address as mentioned above.**

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

SCOPE OF WORKS

NAME OF WORK: SUPPLY, FABRICATION, ERECTION AND RE-GIRDERING OF BR NO.624UP, 655UP, 701 UP, 784DN, 836UP, 929 UP OF R-V LINE AND BR.NO.1205, 890 DN OF KK - LINE WITH RDSO/APPROVED DRAWINGS TO SUIT 25T AXLE LOAD IN VIEW OF MISSION 3000 MT AND OTHER MISCELLANEOUS WORKS SUCH AS FABRICATION AND SUPPLY OF CC CRIBS ETC. IN WALTAIR DIVISION

The indicative scope described hereunder is only indicative and shall be deemed to be inclusive of all items to be executed for successful completion of the work as per Specifications and Drawings.

Agency to read understands and considers all the conditions, special & additional special conditions, instructions, specifications, work scope etc. before quoting rates.

1. **INDICATIVE SCOPE OF WORK: (IN GENERAL, BUT MAY NOT BE LIMITED TO):**
The principal items of works to be executed under this contract will be as follows but not limited to these only:

1.1 Supply, fabrication and erection of welded girders of required spans at site as per RDSO/Railway's approved drawings for 25T Axle load as per M3000.

1.2 Detailed fabrication drawings, scheme for launching/ erection and de-launching will be prepared by the agency as per instruction/ guidance/ consultation of BBJ including their authorized agency and the same need to proof checked by authorities to be nominated by Railway.

1.3 Removal of existing girder and launching of the new girders under traffic block, stacking the removed girder at bridge site as per the instructions of BBJ or Railway's Engineer-in-Charge.

1.4 Casting of bed blocks, replacement of existing bed blocks with the same as per site requirement and as per the instructions of BBJ or Railway's Engineer-in-Charge.

1.5 De-launching of existing girder sand launching of new girders as per the scheme submitted by the agency/ tenderer and approved by BBJ/ Railway.

1.6 Dismantled girders, Tracks, OHE etc. to be returned to Railway's designated place by the Bidder / Agency.

1.7 All other ancillary works for successful completion of works within stipulated time.

Note: The transportation of new girder /components from contractor's fabrication site, workshop or suppliers Stock Yard shall be done at contractor's own cost. However, if required, the agency may need to arrange Railway Wagon at convenient station on payment of admissible freight charges to Railways as applicable.

Loss of items / damages to be items taken from Railways will be fully recovered from the agency/ tenderer.

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TECHNICAL SPECIFICATION

CONCRETE WORK

1. **General:**

1.1 The Bridge work under the contract is to be executed as per relevant IS specifications, IRS specifications and as contained in Indian Railways Unified Standard Specifications-2019.The exposure conditions for Bridges will be mentioned in the drawings. All Codal provisions/ Specifications corresponding to stipulated exposure condition as per IRS Concrete Bridge Code would be applicable for the work.

1.2 **Cement**

1.2.1 Generally, the cement used shall be as follows. However, the prior approval of the Engineer shall be taken for use of any of the cement.
i) 53 Grade Ordinary Portland Cement conforming toIS:12269.
ii) Portland Pozzolana cement conforming toIS:1489 (See note 1.2.3 & 1.2.5 below).

1.2.2 In aggressive environment, where SO3 and Cl ion are present in abundance, preferably ordinary Portland Cement with moderate sulphate resisting properties conforming to specifications as given in Table 1 may be used.

1.2.3 Port land Pozzolana cement shall not be used for PSC works. Port land Pozzolana cement conforming to IS:1489 can be used for Plain concretes and RCC works. When Portland Pozzolana cement is used, it is to be ensured that proper damp curing of concrete is done at least for 14 days and supporting formwork is not removed till concrete has attained at least75%ofthedesign strength.

1.2.4 The sulphate resisting cement conforming to IS: 12330 shall be used only in such conditions where the concrete is exposed to the risk of excessive sulphate attack e.g. concrete in contact with soil or ground water containing excessive amount of sulphate. It shall not be used under such conditions where concrete is exposed to risk of excessive chlorides and sulphate attack both.

1.2.5 The rate of development of strength is slow in case of blended cement i.e. Portland Pozzolana cement and Portland slag cement, as compared to ordinary Portland cement. This aspect should be taken care of while planning to use blended cement. Accordingly, stage of pre-stressing, period of removal of form work and period of curing etc. should be suitably increased.

Table1:
Specification for Ordinary Portland Cement (With Moderate Sulphate Resisting Properties)

Sl No	Characteristics	Limits	
		Not less than	Not more than
1	Ratio Of Percentage Of Lime To Percentage Of Silica, Alumina And Iron Oxide, When Calculated By TheFormulaGivenInIS269.	0.80	1.02
2	Ratio of percentage of Alumina to that to Iron Oxide.	0.86	--
3	Magnesia, (%by Wt.)	--	5
4	Loss on ignition (%by Wt.)	--	4

5	Tri calcium aluminate content (C3A)(%)	6	10
6	Tri calcium silicate contents (C3S)(%)	40	--
7	Physical properties fineness(cm2/g)	2800	3200
8	Soundness‘ Le Chatalier’ method(mm)	--	5
9	Setting Time		
A	Initial (in minutes)	60	--
B	Final (in minutes)	--	600
10	Compressive Strength		
A	7days(N/mm2)	29.5	--
B	28days(N/mm2)	41.7	--

1.2.6 The method of testing to determine the above characteristics and ascertaining the results, shall conform totheprocedureprescribedinIS:269,4031&IS:4032.

1.3 **Reinforcement**

1.3.1 The reinforcement shall be as per the stipulations made in the Schedule of work attached.

1.3.2 All reinforcement shall be free from loose mill scales rust and coats of paints, oil, mud or other coatings that may destroy or reduce bond.

1.3.3 The modulus of elasticity of steel shall be taken as 200KN/mm2.

1.4 **Pre-Stressing Steel**

1.4.1 The pre-stressing steel shall be as per the stipulations made in the Schedule of work attached.

1.4.2 All pre-stressing steel shall be free from splits, harmful scratches, surface flaws, rough, jagged and imperfect edges and other defects likely to impair its use in Pre stressed concrete.

1.5 **Coarse Aggregates**

1.5.1 For plain and reinforced cement concrete or pre-stressed concrete works, coarse Aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. They shall not contain pieces of disintegrated stones, soft, flaky elongated particles, salt, alkali, vegetable matter or other deleterious materials in such quantities as to reduce the strength of durability of the concrete, or to attack the steel reinforcement. All coarse aggregates shall be tested to conform to IS:383. Coarse aggregate having positive alkali –silica reaction shall not be used.

1.5.2 For reinforced cement concrete works, the maximum size of the coarse aggregate can be in the limits of 4.75 to 40 mm but in no case should be greater than one quarter of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the formwork.

1.5.3 The preferred nominal size of aggregate is 20 m for reinforced cement concrete works. Larger sizes up to 31.5 mm may be permitted in special cases where there is no restriction to flow of concrete in a section. If smaller sizes are necessary for any element, 10 mm and 12.5 mm may be used.

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SPECIAL CONDITIONS FOR CONCRETE WORKS

All Concrete work under the contract is to be executed as per relevant IS specifications, IRS standard specifications and as contained in Indian Railways Unified Standard Specifications-2019/2010.

1. **Design Mix Concrete:**

Cement Concrete/Reinforced cement concrete for different elements of the proposed work shall be design mix concrete. Compressive strength of concrete indicated in different item of the concrete works is characteristic compressive strength of concrete at the end of 28days The concrete mix design shall be done as perIS-456 and IS-10262-2009 (corrected up to date) code of practice for design mix.

The mix shall be designed to produce the grade of concrete having the required work ability, durability and characteristic strength not less than stipulated values.

Concrete mix will be designed for Target mean compressive strength= characteristic compressive strength at end of 28 days + (1.65 x standard deviation). Standard deviation depends upon the grade of concrete. Refer Table- 1 of 10262-2009 for suggested values of standard deviation depending on grade of concrete reproduced as under.

Sl. No	Grade of Concrete	Assumed Standard Deviation N/mm2
1	M-10	3.5
2	M -15	
3	M - 20	4.0
4	M – 25	
5	M- 30	5.0
6	M -35	
7	M – 40	
8	M – 45	
9	M – 50	
10	M - 55	

NOTE:-The above values correspond to the site control having proper storage of cement, weigh batching of all materials ,controlled addition of water, regular checking of all materials, aggregate grading and moisture content and periodical checking of workability and strength ,where there is deviation from the above values given in the above tables shall be increased by1N/mm2

Concrete for all the works to be executed under this contract, shall be machine mix only. Hand mixing shall not be permitted.

All materials to be used in the work by the tenderer /contractor shall be subject to the prior approval of the Engineer-in-charge of the work. Before using in the work, tenderer /contractor shall submit sample of materials and arrange for the supplies, only if the same are approved.

Immediately after receiving formal acceptance letter, the tender/contractor should submit the materials such as aggregate, sand, cement, with details of name of the quarry for aggregate, cement brand, grade of cement etc to the approved laboratory to design the concrete mix for M-20 or richer mix. Tests such as specific gravity of cement, sand, metal and testing of cement for physical properties, sieve analysis for fine and coarse aggregate, abrasion, impact And crushing strength etc are to be done by the laboratory to design the concrete mix. Concrete mix design should be done as per IS-10262-2009 with further stipulations indicated in previous para.

The laboratory should submit the result of all the above tests along with design mix calculation for further verification by Railway and to approve the design mix by the Engineer in- charge.

Design mix should be done in Railway Geo-tech labor Government Engineering College /Polytechnics. In case of emergency, if Railway Geo-Tech Labor government engineering colleges/ Polytechnics refuses to conduct the test for Design mix & testing of concrete cubes, then only tests can be conducted in government approved laboratory with the approval of BBJ/ Railway. Cost for carrying out design mix should be borne by the contractor. No extra payment shall be paid to the contractor for the above as the rate quoted are inclusive of carrying out the above design mix charges.

Tenderer /contractor shall to bear all the charges for testing the cement/ reinforcement/aggregate/water etc., at his own cost including transportation of materials to be tested from site of work to laboratories.

Testing of materials is to be done as and when ordered by Engineer-in-charge in the laboratories as mentioned in foregoing para. After mix design, three sets of cubes shall be cast under laboratory condition as per the finalized mix design to check the 7day sand 28days strength. Average compressive strength of the cubes should satisfy the acceptance criteria as stipulated inIS:456-2000.

Anytime, if there is change in the aggregate, change in Grade of Cement, type of cement and also if the age of the cement increases considerably, the tests for the design mix concrete shall be repeated before the aggregates or cement are used in the work.

Ref: Railways letter GM/Vig/BBS'slr.No.GM/V/Engg/SystemImprovement/2474, dt. 02.04.2015.

2. **Cement**

Only ordinary Portland cement 53 Grade and Portland Pozzolana cement shall be used for design mix concrete and shall be conforming toIS-12269-2013&IS-1489- 1991 respectively. Cement testing shall be done for physical properties as and when instructed by BBJ/ Railway's Engineer-in-charge or his representative. The cement contents of various grades of concrete should generally be within the range given as under:-

Grade of concrete	Cement concrete in Kg. Per cum of concrete
M -15	250 to 300
M - 20	280 to 330
M – 25	310 to 360
M- 30	340 to 390
M -35	360 to 420
M – 40	380 to 450
M – 45 TO M-55	400 to 450

The cement contents of various grades of concrete beyond above mentioned range, if required due to considerations of durability or otherwise should be critically examined and re-checked by the Engineer-in- Charge before approving any concrete design mix report.

3. **Aggregate:**

Coarse and fine aggregate to be used in the work shall confirm to IS-383-1970. Coarse aggregate shall invariably be machine crushed well graded of hard granite/black trap/ basalt stone. Lime stone, quarry stone are not acceptable. 40mm stone aggregate shall be used in

the Mass concrete works, for mud mat concrete and temporary staging foundation and shall be hard stone confirming toIS-383- 1970.

4. **Water:**
Only clean potable water free from impurities shall only be permitted for concreting, curing and grouting works.

5. **Reinforcement:**
Reinforcement steel to be used in the works shall be produced from recognized manufacturers i.e. SAIL/TISCO/RINL/any other approved sources only, Bars shall be high strength deformed bars of Fe 500 D grade TMT/ Rebars confirming to IS:1786. Testing of Reinforcement steel shall be done for physical properties as and when instructed by representative of Engineer-in-charge.

6. **Binding wire:**
Binding wire (Galvanized) to be used in the work should be of standard quality. The diameter shall be 16SWG.

7. **Shuttering:**
Contractor should arrange good steel shuttering/ply good shuttering without containing any depressions. Shuttering plates should not contain depressions more than 5 mm. sufficient numbers of stiffeners are to be provided to prevent bulging between end runners. The line, level and surface of the finished work should be absolutely neat and pleasing. No touching of concrete will be allowed after shuttering is struck. Joints between the concrete lifts should be chipped off neatly and the joint should be rubbed with carbon drum stones (rough, medium and smooth) after applying cement mortar 1:3 The rods left in concrete for the purpose of shuttering should be cut 2.5 cm deep from the face of structure by gas cutting and the tie rod hole should filled with epoxy at contractor's cost.
20 x 5 mm wide rubber flats should be placed between the shutters for proper joining to arrest leakage of cement water during concreting and compaction. Before laying the concrete, all the gaps of shutters are to be packed with jute/cotton waste and should be applied with grease and cement slurry to arrest leakage of cement water through joints and other holes.

8. **Cover Blocks:**
Cover blocks of specified thickness to match the required grade of concrete should be cast in advance for ensuring specified cover to all RCC works for which separate payment will not be made, as the rates of all RCC works are inclusive of this element.

9. **Admixture/Plasticizers:**
Admixtures/Plasticizers/ super plasticizers to be mixed with concrete for the purpose of workability, reduction in the cement content, acquiring early strength, etc. shall be procuredasperIS-9103 latest version and payment will be made as per the schedule item.

10. Proportioning, Mixing, Transporting & placing of concrete Batching and mixing of the concrete shall be done by weigh batching and mixing plant, locate data n approved distance duly considering the properties of the mixes And the transport in arrangements available with the Contractor. The Engineer shall approve the plant. Proportioning of various materials shall be done on the batching plant by weight, each type of material being weighed separately. The cement from the bulk stock shall be weighed separately.

The capacity of batching and mixing plants shall be at least 25 percent higher than the capacity for transportation and laying of concrete. All drums that have been out of use for more than 30 minutes shall be thoroughly cleaned before any fresh concrete is mixed in them.

For transportation of concrete Chutes, hoists and winches, transit mixer and agitators and concrete pumps shall be used as approved by BBJ / Railway's Engineer-in-charge. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent materials takes place. No concrete shall be placed in any part to the structure until the approval of the BBJ / Railway's Engineer has been obtained.

11. **Compacting And Curing**

Concrete should mechanically be compacted by using different varieties of vibrators available to suit to situation of work. Adequate nos. of Shutter vibrators, needle vibrators, surface vibrators (plate vibrators) etc. shall be arranged by the contractor for vibrating the concrete mechanically. All cement works shall be cured for 21 days by the contractor at his own cost.

If curing is not being done to satisfy the standard, the Engineer-in-charge may get it done at the contractors cost without any notice to him, as the curing cannot wait for such notice, time etc. The BBJ / Railway's Engineers decision shall be final and binding, as to whether satisfactory curing is being done or not. Contractor should arrange for painting of date of casting of different elements on the structure with paint for monitoring the curing. The cost of the above should be borne by the contractor at his own cost.

12. **Frequency of Sampling of Concrete:**

Minimum frequency of sampling for testing of concrete work should be as per IS-456 Clause15.2.2.

13. **Testing of Concrete:**

The rates for concrete works shall be deemed to include all charges for testing of aggregates and the concrete as required to be done in accordance with specification, including the cost of labour, materials, equipment, moulds, transport, curing etc. For this purpose the contractor shall set up a testing laboratory at his works at the location to be decided by the BBJ / Railway's Engineer. He/They shall also make adequate arrangements for curing of test cubes, so prepared as per the direction of the Engineer. The contractor shall prepare the same at his own cost both for (1) preliminary test and (2) the works tests. All such tests shall be carried out by contractor and the record of same jointly signed by the contractor or his/their representative and Engineer or his representative shall be maintained by the contractor as per the direction of the BBJ / Railway's Engineer.

The contractor shall provide without any extra charge all materials, tools, labour and assistance of every kind which BBJ / Railway's Engineer may demand from his for any test and examination, other than special or independent test, which he shall require to make on the contractor's premises and the contractor shall be are and pay all costs attendants there on. If the contractor fails to comply with the conditions as aforesaid, the Engineer shall his own judgment be entitled to remove for test and examination of any of the material to any premises other than contractor's and in all such cases, the contractor shall bear the cost of transportation and/or carrying out such tests elsewhere. A certificate in writing of the Engineer that the contractor has failed to provide facilities and the means for the test and the examination shall be final.

The contractor shall also provide and deliver for tests, free of charge at such places other than his premises as the Engineer may specify such materials or cubes as he may require. The BBJ/ Railway's Engineer, at his discretion may decide to perform some of the tests on aggregate of concrete at his own laboratory or any other agency he may consider necessary. In all such cases, the contractor shall provide and deliver for tests for such materials or concrete cubes duly cured, free of charges at the premises as may be specified by the Engineer. Any further cost incurred for such tests, shall be recovered from the contractor's bills.

14. **Acceptance Criteria for Concrete.**
Concrete test results shall satisfy Acceptance criteria for various grade of concrete as per IS456-2000, as also mentioned in Annexure4.2 of Indian Railway Unified Standard Specifications-2019.

15. **Field Laboratory:**
The Details of field laboratory to carry out tests will be provided by the contractor as instructed by BBJ / Railway.

16. **Record**
After the work is completed in all respects the contractor shall make available for BBJ/ Railway's for record, tracing drawings on transparent polythene film of all completed works with all details like general arrangements drawings, reinforcement details, structural details etc. are to be made and supplied along with six ammonia copies for record.

16.1 For plain cement concrete works, preferred nominal sizes shall be 20 and 40 mm. larger sizes may be permitted only in special cases, subject to supplemental specifications and precautions.

16.2 For pre-stressed concrete works, the nominal maximum size of aggregate shall usually be restricted to 10 mm less than the minimum clear distance between individual cables or individual un-tensioned steel reinforcement or 10 mm less than the minimum clear distance between individual cables or individual un-tensioned steel reinforcement or 10 mm less than the minimum cover to un-tensioned steel reinforcement whichever is smaller. A nominal size of 20 mm coarse aggregate shall generally be considered satisfactory for pre-stressed concrete works. Primary or Secondary stone crusher should be employed for getting proper size and grading of coarse aggregates.

17. **Sand/Fine Aggregates**
For plain and reinforced cement concrete or pre-stressed concrete works, fine aggregates shall consist of hard, strong, durable, clean particles of natural sand, crushed stone or crushed gravel or suitable combination of natural sand and crushed stone or gravel. They shall not contain dust, lumps, soft or flaky materials, mica and other deleterious materials in such quantities as would reduce the strength or durability of concrete or attack the embedded steel. Motorized sand washing machines should be used for removing impurities from sand. All fine aggregates shall be tested to conform to IS:383. For masonry work, sand shall conform to the requirement of IS: 2116.

18. **Water**

18.1 Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. As a guide, the following concentrations represent the maximum permissible values.

18.2 To neutralize 200 ml sample of water, using phenolphthalein as an indicator, it should not require more than 2ml on 0.1 normal NaOH.

18.3 To neutralize 200 ml sample of water using methyl orange as an indicator, it should not require more than10ml of 0.1 normal HCL.

18.4 1.7.4 The permissible limits for solids shall be as follows:

Item	Permissible limits(Maximum)
Organic	200mg/lit
Inorganic	3000mg/lit
Sulphates(SO4)	500mg/lit
Chlorides(Cl)	250mg/lit*
Suspended matter	2000mg/lit

18.5 In the case of structures of length 30m and below, the permissible limit of chlorides may be1000mg/lit.

18.6 All samples of water (including potable water) shall be tested and suitable measures taken where necessary.

18.7 The PH value shall generally be not less than 6. Whenever necessary tests should be done as per IS:3025. Mixing and curing with sea water shall not be permitted.

19. **Work ability of Concrete**

19.1 The concrete mix proportions chosen should be such that the concrete is of adequate work ability for the placing conditions of the concrete and can be properly compacted with the means available.

19.2 Suggested ranges of workability of concrete for some placing conditions are given in Railway Concrete Bridge Code vide clause 5.3.

20. **Durability**

20.1 The durability of concrete depends on its resistance to deterioration and the environment in which it is placed. The resistance of concrete to weathering, chemical attack, abrasion, frost and fire depends largely upon its quality and constituents' materials. Susceptibility to corrosion of the steel is governed by the cover provided and the permeability of concrete. The cube crushing strength along is not are liable 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 in three levels of exposure that is moderate, severe, and extreme, as described in Railway Concrete Bridge Code vide clause 5.4.1.

21. **Permeability**

One of the main characteristics influencing the durability of any concrete is its permeability. Therefore, tests for permeability shall be carried out for concrete bridges as directed by Engineer-In-Charge. With strong dense aggregates, a suitability low permeability is achieved by having a sufficiently low water cement ratio, by ensuring as through compaction of the concrete as possible and by ensuring sufficient hydration of cement through proper curing methods. Therefore, for given aggregates, the cement content should be sufficient to provide adequate workability with a low water-cement ratio so that concrete can be completely compacted by vibration. The depth of penetration of moisture shall not exceed 25mm.

Permeability test: tests for permeability shall be carried out for concrete bridges as recommended in Railway Concrete Bridge Code vide clause5.4.2.

a) Permeability test shall be mandatory for all RCC/PCC bridges under severe and extreme environment.
b) Under moderate environment, permeability tests hall be mandatory for all major bridges and for other bridges permeability testis desirable to the extent possible.

c) Permeability test is required for RCC/PCC structural element only. Maximum Water-Cement Ratio: The limits for maximum water cement ratio for design mix shall be based on environmental conditions as defined in Clause 1.10.1.
d) The limits for maximum water-cement ratio for different environmental shall be as per Railway Concrete Bridge Code clause 5.4.3 as given in table below:

Maximum Water Cement Ratio

Exposure conditions	Maximum water–Cement Ratio		
	Plain concrete (PCC)	Reinforced concrete (RCC)	Pre stressed concrete (PSC)
Moderate	0.50	0.45	0.40
Severe	0.45	0.40	0.40
Extreme	0.40	0.35	0.35

Minimum 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 stipulated in Rly Concrete Bridge Code clause 5.4.4, as given below:

For Bridges in Pre-stressed concrete and Important Bridges

Exposure conditions	Minimum Grade of concrete		
	Plain concrete (PCC)	Reinforced concrete (RCC)	Prestressed concrete (PSC)
Moderate	M-25	M-30	M-35
Severe	M-30	M-35	M-40
Extreme	M-35	M-40	M-45

For Bridges other than mentioned above and sub-structure

Exposure conditions	Minimum Grade of concrete	
	Plain concrete (PCC)	Reinforced concrete (RCC)
Moderate	M-15	M-20
Severe	M-20	M-25
Extreme	M-25	M-30

Cementitious material content: 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 per Rly Concrete Bridge Code clause 5.4. as given in the table below. Maximum cementitious material content shall be limited to 500kg/M3

Exposure conditions	Minimum Cementitious Material Content		
	Plain concrete (PCC)	Reinforced concrete (RCC)	Prestressed concrete (PSC)
Moderate	240	300	400
Severe	250	350	430
Extreme	300	400	440

Total chloride contents: The total chloride content by weight of cement shall not exceed the following values:
a) For pre stressed concrete works:
i) Under extreme environment 0.06%
ii) Under severe and moderate environment 0.10%
b) For RCC works 0.15%

22. **Concrete Mix Proportions.**

22.1 Mix Proportion: The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing, so that after compaction its surrounds all reinforcements and completely fills the formwork. When concrete gets hardened, it shall have the required strength, durability and surface finish.

22.2 The determination of the proportions of cement, aggregates and water to attain the required strength shall be made as follows:

22.3 By designing the concrete mix; such concrete shall be called 'Design mix concrete'; or by adopting nominal concrete mix; such concrete shall be called 'Nominal mix concrete'.

22.4 Design mix concrete is preferred to nominal mix. Nominal mixes when used are likely to involve higher cement content. Concrete of grades richer than M 20 shall only be design mix concrete.

23. **Design Mix Concrete**

23.1 The mix shall be designed to produce the grade of concrete having the required work ability, durability and characteristic strength not less than stipulated values. The procedure given in IS:10262 may be followed for mixed design. The value of Standard deviation as given in IR Concrete Bridge code for various grade of concrete shall be adopted.

23.2 Nominal Mix Concrete: Nominal Mix Concrete may be used for concrete of grade M 20 or lower. The proportions of materials for nominal mix concrete shall be in accordance with Concrete Bridge Code

24. **Mix Design**

24.1 The concrete mix shall be designed on the basis of preliminary tests. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with the means available.

24.2 The mixing plant and the methods of transporting and depositing the concrete to be employed in the work shall be used to simulate working conditions with the trial mixes.

24.3 All these preliminary tests, approval etc. shall be got done in advance by the contractor before any concreting is contemplated. Failure on the part of the Contractor to do so and the consequent delay in the completion of the works will not entitle him for any compensation whatsoever, either financially, or by way of extension of time.

25. **Mix proposals:**

25.1 Based upon the successful preliminary crushing and workability tests, the Contractor shall submit mix proposals to the engineer, who will have the right to reject any trial mix not deemed satisfactory. Selection of the trial mix to the complete satisfaction of the Engineer shall be the ultimate responsibility of the contractor.

25.2 Except where it can be shown to the satisfaction of the BBJ/ Railway's Engineer that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions as required. Different sizes, however, shall be stocked in separate stock Wells, Required quantity of materials shall be

stock-Wells several hours, preferably a day, before use. Grading of coarse and fine aggregate shall be checked as frequently as possible, frequency for a given job being determined by the engineer to ensure that the suppliers are maintaining uniform grading as approved for samples used in the preliminary tests.

25.3 In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stocks at site and not by bags, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

25.4 It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible, frequency for a given job being determined by the Engineer according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the aggregates, IS: 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates to allow for the variation in weight of aggregates due to variation in their moisture content.

26. **Mixing concrete**

Batching and mixing of the concrete shall be done at a batching and mixing plant with automatic controls, located at an approved distance duly considering the properties of the mixes and the transporting arrangements available with the Contractor. The Engineer shall approve the plant.

27. **Proportioning of materials**

27.1 Proportioning of various materials shall be done on the batching plant by weight, each type of material being weighed separately. The cement from the bulk stock shall be Weighed separately.

27.2 All the materials and sources should be as per the design mix parameters and all the conditions as stipulated in IS: 4925 are to be followed.

27.3 The contractor has to make arrangements for frequent inspection of the plant by Engineer-In-Charge or his representative as and when required.

27.4 The capacity of batching and mixing plant shall be at least 25 percent higher than the capacity for transportation and laying of concrete.

27.5 All drums that have been out of use for more than 30 minutes shall be thoroughly cleaned before any fresh concrete is mixed in them.

28. **Transporting, placing and compaction of concrete.**

28.1 For transportation of concrete Chutes, hoists and winches, transit mixer and agitators and concrete pumps shall be used.

28.2 2 The Engineer shall approve the method of transporting and placing concrete. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent materials takes place. All formwork cleaned and made free from standing water, dust, snow or ice immediately before placing concrete.

28.3 No concrete shall be placed in any part of the structure until the approval of the BBJ/ Railway's Engineer has been obtained.

28.4 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 construction joints. Fresh concrete shall not be placed against concrete that has been in position for more than 30 minutes unless a proper construction joints is formed.

29. **Concreting under Water**

29.1 When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of the mix to be used shall be got approved from the Engineer before any work is started. Such concrete shall not be considered as "Controlled Concrete".

29.2 Concrete shall not be placed in water having a temperature below 5o C. The temperature of the concrete, when deposited, shall be not less than 16o C, not more than 40o C.

29.3 Concrete shall contain 10 per cent more cement than that required for the same mix placed in the dry. The material shall be so proportioned as to produce a concrete having a slump ofnotlessthan150mm, and not more than 200 mm. The slump shall be tested as per IS: 516.

29.4 Cofferdams or forms shall be sufficiently tight to ensure still water conditions, if practicable, and in any case to reduce the flow of water to less than 3 meters per minute through the space into which concrete is to be deposited. Cofferdams or forms in still water shall be sufficiently tight to prevent loss of mortar through the joints in the walls. Pumping shall not be done while concrete is being placed, or until 24 hours thereafter.

29.5 All under water concreting should be carried out by tremie method only, with tremie of appropriate diameter. The number and spacing of the tremie should be worked out to ensure proper concreting. The tremie concreting when started should be continued without interruption for the full height of the member being concreted. The concrete production and placement equipment should be sufficient to enable the underwater concrete to be completed uninterrupted within the stipulated time. Necessary stand-by equipment should be available for emergency situation.

29.6 The top section of the tremie shall be a hopper large enough to hold one full batch of the mix or the entire contents of the transporting bucket if any. The tremie pipe shall not be less than 200 mm in diameter, and shall be large enough to allow a free flow of concrete and strong enough to withstand the external pressure of the water in which it is suspended, even if a partial vacuum develops inside the pipe. Preferably, flanged steel pipe of adequate strength for the job shall be used. A separate lifting device shall be provided for each tremie pipe with its hopper at the upper end. Unless the lower end of the pipe is equipped with an approved automatic check valve, the upper end of the pipe shall be plugged with a wadding of gunny sacking or other approved material before delivering the concrete to the tremie pipe through the hopper, so that when the concrete is forced down from the hopper to the pipe it will force the plug (and along with it any water in the pipe) down the pipe and out of the bottom end, thus establishing a continuous stream of concrete.

29.7 It will be necessary to raise slowly the tremie in order to allow in uniform flow of concrete, but it shall not be emptied so that water enters above the concrete in the pipe. At all times after the placing of concrete is started and until all the required quantity has been placed, the lower end of the tremie pipe shall be kept 600 mm below the surface of the plastic concrete. This will cause the concrete to build up from below instead of flowing out over the surface, and thus avoid formation of layers of laitance. If the charge in the tremie is lost while depositing, the tremie shall be raised above the concrete surface, and unless sealed

by a check valve it shall be re-plugged at the top end, as at the beginning, before refilling for depositing further concrete.

29.8 To minimize the formation of laitance, great care shall be exercised not to disturb the concrete as far as possible while it is being deposited.

30. Protection and Water curing

30.1 Curing is the process for preventing the loss of moisture from the concrete. The prevention of moisture loss from the concrete is particularly important if the water-cement ratio is low.

30.2 Curing and protection shall start immediately after the compaction of the concrete to protect it from

i) Premature drying out, particularly by solar radiation and wind.
ii) High internal thermal gradients.
iii) Leaching out by rain and flowing water.
iv) Rapid cooling during the first few days after placing.
v) Low temperature or frost.
vi) Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement.

30.3 Where members are of considerable size and length, with high cement content, accelerated curing methods are to be applied, as approved in detail by the BBJ/ Railway's Engineer.

30.4 Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacks, canvas, hessian, or similar materials and shall be kept constantly wet for a period of not less than fourteen days from the date of placing of concrete.

30.5 Special attention should be paid to curing of concrete in order to ensure maximum durability and to minimize cracking.

30.6 Sea water shall not be used for curing. Sea water shall not come into contact with concrete members unless it has attained the desired strength.

30.7 Masonry work over the foundation concrete may be started after 48 hours of it's laying but the curing of concrete shall be continued for a minimum period of14days.

30.8 Wherever possible, use of water sprinklers or perforated pipes should be encouraged for curing of concrete. Such arrangements must be maintained for a minimum period of 14 days after concreting.

30.9 Approved concrete curing compounds should be preferred where water curing cannot be done reliably.

31. Working in Extreme Weather

31.1 Where concrete is to be deposited at or near freezing temperatures, precautions shall be taken to ensure that at the time of placing it has a temperature of not less than 5° C and that the temperature of the concrete shall be maintained above 4° C until it has

Thoroughly hardened. When necessary, concrete in gradients shall be heated before mixing. Cement shall however not be heated other than by the heat transmitted to it from other ingredients of the concrete. In general, heating the mixing water along to about 66° C may suffice for this purpose. Dependence shall not be placed on salt or other chemicals for the

prevention of freezing. Calcium chloride upto one and a half per cent by weight of the cement can be used to accelerate the rate of hardening provided it does not accelerate corrosion. Use of calcium chloride in excess of this percentage is considered harmful. No frozen material or materials containing ice shall be used. All concrete damaged by frost shall be removed. It is recommended that concrete exposed to freezing weather shall have entrained air and the water content of the mix shall not exceed 30 litres per50 Kg of cement.

31.2 When depositing concrete in very hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 40o C while placing. This shall be achieved by stacking aggregate under the shade and keeping them moist, using cold water, reducing the time between mixing and placing to the minimum, cooling formwork by sprinkling water, starting curing before concrete dries out and restricting concreting, as far as possible, to mornings and evenings.

32. Finishing

32.1 Immediately after the removal of forms, all exposed bars or bolts passing through the reinforced cement concrete member and used for shuttering, or any other purpose shall be cut inside the reinforced cement concrete member to a depth of at least 25 mm below the surface of the concrete and the resulting holes be closed by cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honey comb spots, broken edges or corners, and other defects, shall be thoroughly cleaned, saturated with water, and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in of all voids. Surfaces that have been pointed shall be kept moist for a period of twenty-four hours.

32.2 All construction and expansion joints in the completed work shall be left carefully too led and free from any mortar and concrete. Expansion joint filler shall be left exposed for its full length with clean and true edges.

32.3 Formwork shall include all temporary or permanent forms required for forming the concrete, together with temporary construction required for their support.

33. Storage, testing and acceptance of Materials

33.1 General

All materials may be stored in 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 storage of the materials. All such materials, even though stored in approved godowns /places, must be subjected to acceptance test prior to their immediate use.

33.2 Cement

Cement shall be transported, handled and stored on the site in such a manner as to avoid deterioration or contamination. Cement shall be stored above the ground level in perfectly dry and watertight 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 to 4 months. 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 that has deteriorated in any way, during storage, shall not be used in the works and shall be removed from the site by the contractor without any extra cost to BBJ.

34. Bending of Reinforcement

34.1 Reinforcing steel shall conform accurately to the dimensions given in the Bar Bending Schedules shown on relevant drawings.

34.2 1.22.2 Bars shall be bent cold to the specified shape and dimensions or as directed the Engineer using a proper bar bender, operated by hand or power to attain proper radii of bends.

34.3 Bars shall not be bent or strengthened in a manner that will injure the material.

34.4 Bars bent during transport or handling shall be straightened before being used on work, they shall not be heated to facilitate bending.

34.5 Unless otherwise specified the type of hook to be provided at the end of each barshall be indicated in the bar bending schedule. The hook shall be suitably encased to prevent any splitting of concrete.

35. Placing of reinforcement

35.1 General

a) All reinforcement shall be free from rust, loose mill scales or coats of oil, paints etc. and chloride contamination which may destroy bond. This may be ensured either by using reinforcement fresh from the factories or thoroughly cleaning all reinforcement to remove all the rust using any effective method such as sandblasting.

b) The reinforcement cage should generally be fabricated in the yard at ground level and then shifted and placed in position. The reinforcement shall be provided strictly in accordance with the drawings and shall be assembled in position only when the structure is otherwise ready for placing of concrete. A prolonged time gap between the assembling of reinforcements and placing of concrete that may result in rust formation of the surface shall not be permitted.

c) Reinforcement bars shall be placed accurately in position as shown in the drawings. The bars, crossing one another shall be tied together at every intersection with galvanized wire of not less than 1 mm in dia and conforming to IS: 280 to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during the deposition of concrete, or any other operation of the work.

d) The bars shall be kept in position by the following paragraphs maintaining cover.

e) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and shuttering subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcements as to secure and maintain the requisite cover of concrete over reinforcement. If such cover blocks are not available concrete cover blocks made of concrete having the same strength and specification as of the member may be provided.

f) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timer templates with slots accurately cut in tem; or with industrially produced polymer cover blocks tied to the reinforcement. Timber templates shall be removed after the concrete has progressed up to a level just below them.

g) Spacer bars shall separate layers or reinforcements at approximately 1000 mm intervals. The minimum diameter of spacer bars shall be 12 mm or equal to maximum size of main reinforcement or maximum size of coarse aggregate whichever is greater.

h) Necessary stays, blocks, metal chairs spacers, metal hangers, supporting wires etc, or other subsidiary reinforcement shall be provided to fix the reinforcements firmly in its correct position. The cost of such subsidiary reinforcement will not be paid and shall be included in the steel price quoted.

35.2 Precautions:
Main reinforcement shall not be allowed to sag between supports. Reinforcements projecting from surface of newly placed concrete shall be supported in such a way that the no sag or risk or damage the newly placed concrete. In severe environment, such projecting reinforcements that are likely to remain exposed for a long time shall be protected by cement grout/anti-corrosive treatment. In case of cement grout the same shall be thoroughly cleaned and wire brushed before depositing fresh concrete.

36. Admixtures

36.1 Use of admixtures and super plasticizers for concrete shall be encouraged to improve workability, quality and reliability.

36.2 The plasticizer/retarder/admixture shall conform to IS: 6925 & IS 9103. They should be chloride free and free and low in sulphate content. The contractor at his cost shall test each lot of admixtures. The use of admixture shall be made as per the manufacturer's guidelines. Prior approval of engineer is necessary for its uses.

37. Design of Form work:

37.1 The contractor, without any extra cost to the Railways shall design formwork including complete false work and shall be got approved by the Engineer. Only steel form work shall be used.

37.2 The formwork should be robust and strong and the joints should be leak-proof. The staging, scaffolding and shuttering are required to be properly designed so that their erection as well as striking can be conveniently done. The design should also ensure that at the time of striking, the concrete does not get disturbed and the forms are conveniently removed. For this, wooden or other types of packing should be designed and placed in position for easy removal of the form work.

37.3 The contractor shall be entirely responsible for the adequacy and safety for form work not withstanding any approval or review by the Engineer of his drawing and design.

37.4 If a proprietary system of formwork is used, a detailed information as per shall be furnished to the Engineer for approval.

37.5 The number of joints in the form work should be kept minimum in both directions – horizontal and vertical – by using large size panels. The design should provide for proper "soldier" to facilitate alignment to the required degree. All joints must be properly sealed. Use of PVC joints sealing tapes, foam rubber or PVC T Section is essential to prevent leakage of grout.

37.6 Bally should not be used as staging. Staging must have cross bracing and diagonal bracing in both directions.

37.7 Where centering or launching trusses are adopted for casting of superstructure, the joints

of the centering trusses, whether welded, riveted or bolted should be thoroughly checked before proceeding with the concreting. Also, various members of the centering trusses should be examined for proper alignment and unintended deformation before proceeding with the concreting.

37.8 For distribution of load and load transfer to the ground through staging, an appropriately designed base plate must be provided which shall rest on firm substratum.

37.9 Water used for curing should not be allowed to stagnate near the base plates supporting the staging and should be properly drained.

37.10 1.25.9 The design of false work should be such as to facilitate proper and safe access to all parts for inspection.

37.11 1.25.10 Removal of the form should be planned as a part of the total formwork design. For piers taller than 30 meters, slip forming shall be preferred.

37.12 The chamfers, beveled edges and mouldings shall be made in the formwork itself. Opening for fixtures and other fittings connected with service shall be provided in the shuttering as directed by the Engineer.

37.13 As far as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable a minimum number of nails shall be used, and these shall be left projecting so that they can be easily withdrawn. Use of double headed nails shall be preferred.

37.14 The formwork shall be made so as to produce a finished concrete true to shape, line levels, plumb and dimensions as shown on the drawing, subject to the tolerance mentioned in Rly Concrete Bridge Code clause 6.5.

37.15 1.25.14 Tolerance given above are specified for local aberration in the finished concrete surface and structure taken as a whole or for the setting and alignment of formwork, which should be as accurate as possible to the entire satisfaction of the Engineer.

38. **Removal of Formwork**

38.1 The form work shall be so removed as not to cause any damage to concrete. Centering shall be gradually and uniformly lowered in such a manner as to avoid any shock or vibration. Support shall be removed in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually.

38.2 The whole of the formwork removal should be planned, and a definite scheme of operation worked out.

38.3 In no circumstances should forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of striking but not before the period as mentioned in IS:456, where ordinary Portland cement is used.

38.4 Where possible the formwork should be left as long as it would assist curing. The form should be eased carefully in order to prevent the load being suddenly transferred in order to avoid shock or vibration. The Engineer shall be informed in advance by the Contractor of his intention of striking any formwork and the prior approval of Engineer shall be taken.

38.5 The guidelines as mentioned under in the IR Concrete Bridge Code vide clause 6.4 shall be followed to determine the time of removal of formwork:

A	Walls, piers and abutment columns and vertical faces of structural members	48 HRS
B	Soffits of slabs	14 DAYS
C	Soffits of beams	21 DAYS

38.6 For other than OPC, the above time may be suitably modified. For Portland Pozzolana cement Time will be10/7 times the period stated above.

38.7 It shall be ensured that the marks of the joints between panels are not seen on the finished concrete surface. After manufacture and before fixing each formwork shall be got approved by the BBJ / Railway's Engineer.

39. **Discoloration**

Formation of blotches and stains due to detachment of formwork panel from the concrete when adjacent portion in the same lift is till adhering shall not be allowed to occur, and for this purpose, all shutters shall be struck off at the same time.

40. **Ties**

Uses of ties shall be very much restricted, as far as practicable. Wherever ties are used they shall be used with HDPE sheathing so that the ties can be easily removed and no projecting parts prone to corrosion are left. The sheathing shall be grouted with cement mortar of the same strength as that of the structure. Form work shall be supported without ties by propping against staging erected firmly for the purpose.

41. **Cleanup**

After forms are stripped all materials to be reused shall be thoroughly cleaned. Holes bored by driving in common corks or formed plastics patching plaster may also be used to fill small holes. After cleaning and before refixing, form work shall be got approved by the Engineer.

42. **Number of uses of Form work**

Formwork and staging shall be so used so as to maintain quality of the exposed surface. However, if in the opinion of the Engineer, any particular panel / member have become unsatisfactory for use at any stage, the same will be rejected. However, the maximum number of uses for steel form work shall be limited to 20 times.

43. **Form work for exposed concrete work**

43.1 All exposed concrete surfaces are to have form finish and shall be cast in an approved form work and shall be free of honey combing, fins, projections and air holes.

43.2 The Contractor shall submit shuttering drawings and details of pattern and the method of forming joints in the exposed (form-finish) concrete to the Engineer for his approval and all changes and modification by the former and final approval thereof obtained, from the Engineer.

43.3 In all types of formworks to form finished exposed concrete, only non-staining mould oil supplied by an approved manufacturer shall be used.

43.4 The repetitive usages of the same formwork to cast form finished exposed concrete shall be as decided by the Engineer and in no case the formwork not guaranteed to produce the required form finish to the satisfaction of the Engineer shall be used.

43.5 The exposed concrete shall have uniform finish. The finish of the concrete when shuttering and formwork are removed will generally be without any blemish and will not require touch

up. Slight touch up for a small spot or two, if necessary, shall be carried out expertly so as to be harmonious with the entire surface.

44. **Temporary Structures**

Before start of work contractor should submit a detailed layout plan of Camp/Structure being created to facilitate completion of work to Engineer. The plan should be elaborate and along with design. This should include camp, casting yard, batching plant, temporary sheds and temporary bridges etc.

45. **Setting out of Bridge**

45.1 The set out for the bridge would be given by the contractor based upon reference points that would be established by them. Detailed Scheme of set out, establishment of reference points etc. would however be submitted to Engineer for their approval.

45.2 Permanent pillars would be established which should facilitate easy check in go alignment / centre point/ Level at each stage of work.

45.3 Maintaining correct line and level of all the Bridge would be responsibility of contractor not withstanding alignment /centerline /level are checked by Engineer at regular intervals.

45.4 Contractor should make available all necessary facilities namely instruments, labour etc. to Engineer/his representative to enable them check of alignment/center point/level at every stage.

Details of Deployment of manpower in the form of Project Manager, site Engineer, Technicians/Supervisor, Surveyor, Liaison Manager etc.,

Sl. No.	Position	Minimum No. of Personnel	Qualification &Experience in similar works	Liquidated damage to be paid by the contractor
1	Resident Engineer	01 No.	Engineering Graduate (Civil) with minimum 07 (Seven) years' experience in Fabrication of heavy steel structures / girder bridges.	Rs.80,000/-per month or part thereof
2	Site Engineers			
	(i)Fabrication of Bridge girder	01 No.	Qualified Diploma Engineer (Civil/ Mechanical) with minimum 5(Five) years' experience in Fabrication of heavy steel structures / girder bridges	Rs.40,000/-per month or part thereof.
3	Technicians/ Supervisors			
	i) Fabrication of Bridge girder	02 Nos.	Minimum Diploma in Civil Engineering with 03(three) years' experience in Fabrication of heavy steel structures / girder bridges.	Rs.25,000/-per month or part thereof.
4	Survey & Drawing team	01 No.	Diploma in Civil Engineering with 3 years' experience in survey & Drawing works in	Rs.25,000/-per month or part thereof.

			Bridges	
5	Safety Officer	01 No.	Preferably Graduate in any discipline/But must have completed Diploma for safety.	Rs.25,000/-per month or part thereof.

NOTE:

1. **The details of nos. & position of Engineers/Personnel required for various works to be deployed, shall be as per requirement of Railway and approved by BBJ, considering all factors.**
2. The personal to be engaged as above is to be got approved by BBJ.
3. **The survey team** to be deployed by the contractor which should consist of one well experienced survey engineer. The survey team should have survey instruments like DGPS, Advance Total Station, Digital level and other accessories.
4. The contractor shall be liable to pay liquidated damage at the rates, as prescribed above, if man powers are not engaged within Two months from issue of Acceptance Letter.

SPECIAL CONDITIONS & GUIDELINES FOR FABRICATION, ERECTION AND REGIRDERING OF STEEL GIRDERS

1. **Specification & Interpretation**

This specification is intended mainly to cover technical provisions relating to fabrication and erection of steel girder bridges including supply of the materials through contract**.**

This specification makes reference to the Indian Standard (IS), Indian Railway Standard (IRS), RDSO's Specifications (M&C) & RDSO Guidelines (BS).

Wherever reference to the standards mentioned in clause i.e., IS, IRS & RDSO Specification, it shall be taken as a reference to the latest version of the standards.

Any revision or addition or deletion of the provisions of this Specification shall be issued only through correction slip. No cognizance shall be given to any policy directives issued through other means.

2. **Responsibility for Completeness**

The Contractor shall be entirely responsible for the execution of the contract in all respects in accordance with the terms of this Specification and the conditions of contract, notwithstanding any approval which the Engineer/Inspecting Officer may have given to the detailed drawings prepared by the Contractor for materials or other parts of the work involved in the contract or for tests carried out, either by the Contractor or by the Engineer/Inspecting Officer.

Any fitting, accessory or apparatus which may not have been mentioned in this Specification, but which are usual or necessary in the execution of such work, are to be provided by the Contractor without extra charge. 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 Requirements to be separately provided for by the Purchaser.

3. **Stacking of Materials**

On receipt of materials at the bridge yard they shall be carefully unloaded examined for defects, checked, sorted and stacked securely on a level bed out of danger from flood or tide and out of contact with water or ground moisture. All Material shall be available for inspection by the Engineer or Inspecting Officer.

Materials shall be verified with the markings shown on the marking plan of part list, which shall be supplied by the manufacturers or the Engineer.
Any material 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.

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.

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.

The Contractor shall unload the material promptly on delivery; otherwise he/she shall be responsible for demurrage charges.

On receipt of rolled steel at workshop or fabrication yard they shall be carefully unloaded and stacked properly to avoid bending, twisting, corrosion etc.

4. **Imported Material**

In case of work fabricated in India, where any material or component is imported, such material or component will be inspected, if desired by the Contractor, Purchaser or Inspecting Officer, and passed in the country of origin before dispatch to India. In such cases the Contractor shall submit to the Inspecting Officer details on prescribed form in quadruplicate of the materials or components to be inspected together with the requisite number of copies of all necessary documents, to enable inspection to be carried out prior to dispatch. The cost of such inspection and supervision of tests in connection there with will be borne by the Purchaser, the Sub-Contractor providing free of charge all material, labour and appliances for carrying out tests made in his/her works and any material which may be required for independent tests and analysis.

5. **Leading to Site**

Care must be taken by the Contractor to see that the parts at site are available in proper sequence.

6. **Line sand Levels**

All lines and levels should be given by the BBJ/ Railway's Engineer and all stakes and marks so given shall be carefully preserved by the Contractor who shall give all necessary assistance and facilities to establish or check the lines and levels and to measure the work.

7. **Steel**

IS:2062, Quality "A" Grade Designation E250 as rolled semi-killed or killed shall be used for foot-over bridges and other structures subjected to non-critical loading.

IS:2062, Quality "B0" Grade Designation E250 fully killed and with normalizing/ normalizing rolling/controlled rolling where service temperature does not fall below 0°C, shall be used for welded/riveted girders subjected to Railway loading. Plates less than 12 mm thick need not be with normalizing/normalizing rolling/controlled rolling.

IS:2062, Quality "C" Grade Designation E250 fully killed and with normalizing/normalizing rolling/controlled rolling ensuring impact properties at(-) 20° C shall be used for sub-zero temperature areas for welded/ riveted girders subjected to Railway loading. Plates less than 12 mm thick need not be with normalizing/ normalizing rolling/ controlled rolling.

NOTE:
1. In case Rolled Steel Section confirming to IS:2062 Quality "B0" or "C" are not available in market, CAO(C)/CBE may permit use of steel confirming to IS:2062 Quality "BR" on case-to-case basis by satisfying himself about non availability of quality "B0" or "C".

2. In case Rolled Steel Section confirming to IS:2062 Quality "BR" is also not available in market, CAO(C)/CBE of Railway may permit use of steel confirming to IS:2062 Quality "A" on case-to-case basis, by satisfying himself about non availability of quality "BR".

High tensile steel shall comply in all respects with the requirement of IS:2062 Grade Designation E410 Quality B0 or C (copper bearing quality) for the welded work.

For superior and enhanced corrosion resistance for sections, plates and bars for welded, rivetted or bolted construction, the material shall comply with the requirement of IRS:M-42, Gr.I or Gr.II for riveted /bolted or welded work respectively.

Steel, which is to be cold pressed, shall comply with the requirements of IS:2002. Steel for bolts shall conform to property class 4.6 or 6.6 as specified in IS:1367 accordingly, as the structural steel specification is for mild steel or high tensile steel.

Steel for drifts shall be in accordance with IS:1875 for forged quality steel or IS:7283 for hot rolled bars.

Steel for rivets shall comply with the requirement of IS:1148 for hot rolled rivet bars for general structural purposes and IS:1149 for high tensile steel rivet bars for high strength structural purposes. For high strength low alloy structural steel rivet bars with enhanced corrosion resistance for use in bridges, steel shall comply with the requirement of IRS:M-43.

The dimensions of all rolled sections must agree with the contract drawings or as agreed to between the Purchaser and the Contractor.

The rolling and cutting tolerances shall be in accordance with IS:1852 or as agreed to between the Purchaser and the Contractor if closer tolerances are desired, they shall be shown in the drawing.

All the steel sections used in the fabrication must have mill test certificate clearly indicating the specification to which the steel conforms and whether steel is killed and normalized. All the cast mark numbers/ heat mark numbers, shall be recorded along-with the number of plates in a register as soon as the plates are received in the workshop. Whenever the steel is received without any test certificate, a sample test piece from plate of each cast mark number is to be cut and sent for testing. Only when it is established that the plates are of required specification, these shall be processed for cutting.

Use of steel of any quality other than those mentioned above would require the prior approval of the Engineer.

8. **Pins and Expansion Rollers**
Pins and Expansion Rollers shall be made from steel conforming to IS:2004 (Class3steel).

Expansion rollers may, alternatively be turned from approved carriage and wagon axles. Only axles manufactured after 1931 shall be used for the manufacture of rollers. USFD test shall be conducted to ensure freeness from internal flaw. Test pieces shall be left as an integral part of the roller with the stamp of the supplier on it so that the Accepting Authority

can cut-off the test pieces and check if required.

9. **Steel Castings**
Steel casting shall comply with IS:1030 for normal temperature zone and to IS:4899 for use at low temperature zone.

10. **Bronze Plates**
Bronze plates shall be of phosphor bronze complying with IS:1458 Class I.

11. **Maintenance of Records by Fabricators**
The records of fabrication shall be maintained in the registers by the Agency / tenderer.

12. **Manufacture**
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. For manufacture of the components of all spans to be made strictly interchangeable, approved set of same jigs and assembly fixtures shall be used. The tolerances in manufacture shall be in accordance with as shown in **Appendix-II of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001**. The Contractor shall state which of the following alternative methods of manufacture he/she intends to adopt.

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

ii) All spans to be made strictly interchangeable. 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.

13. **Templates**
The templates throughout the work shall be of steel. The template shall be used for marking of cutting material and as well as profile machining for girders of railway loading. Templates shall be used for marking of drilling holes in steel structures other than girder of Railway loadings. In case where actual materials from a bridge have been used as templates for drilling similar pieces the Inspecting Officer will decide whether they are fit to be used as part of the finished structure.

14. **Flattening and Straightening**
All steel materials, plates, bar sand structural's 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 conditions shall not be carried out unless authorized and approved by the Inspecting Officer.

15. **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 after wards.

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 Inspecting Officer, a tolerance of 0.4mm may be permitted at isolated places on the butting line.

16. **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. Drag lines 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 oxyacetylene 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.

17. **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 rivet 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 counter sunk heads of rivets, bolts or screws shall be drilled to the correct profile so as to keep the heads flush with the surface Holes for countersunk heads of rivets, bolts or screws shall be drilled to the correct profile so as to keep the heads flush with the surface No sub-punching shall be allowed in the main truss members of open-web girders. Holes for turned bolts should be 1mm under drilled in shop and should be reamed at site to suit the diameter of turned bolt.

Where the number of thicknesses to be riveted exceeds three or the total thickness is 90mmor more, the rivet holes, unless they have been drilled through steel-bushed jigs, shall be drilled out in place 3 mm all round, after assembling. In such cases the work shall be thoroughly bolted together.

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 rivet holes completely removed.

18. **18. Parts in Contact**

All steel work intended to be riveted or bolted together shall be in contact over the whole surface.

Drifts as shown in **Fig. 2 of IRS Specification for Bridge Fabrication and Erection of steel girders serial No. B1-2001**may be used for drawing light members into position but their use on heavy members should be restricted to securing them in their correct positions No extent that holes are distorted.

Drifting to enlarge un-faired holes is prohibited. The holes that will have to be enlarged to admit rivets should 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 Purchaser retains the right to reject all steel work if the holes are not properly matched.

19. **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.

Bolting and Drifting: - Only barrel drifts as per **Fig. 2 of IRS Specification for Bridge Fabrication and Erection of steel girders serial No. B1-2001** shall be used in erection. They may be used for drawing light members into position; but their use on heavy members shall be restricted to securing them in their correct position. Any apparent error in shop work, which prevents the assembling and fitting up of the parts by the proper use of these drifts, shall be investigated immediately. As all work is rigidly inspected in the manufacturers work before dispatch, these difficulties should not arise and the cause should Be first be sought in the use of incorrect components or the transposition of a correct part. It is usually important that parts should be correctly handled. Should error still persist, the matter shall be immediately reported to the Engineer who will decide what action is to be taken. No reaming shall be undertaken without the written authority of the Engineer, except for the under drilled holes meant for turned bolts. If approved, the Contractor shall supply, at his /her own expense, any special rivets that may be required. Copies of all correspondence relative to their course to reaming and the use of over-size rivets shall invariably be sent by the Engineer for information to the inspector at concerned.

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.

Special methods of erection other than described in **Appendix III of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1- 2001**. In cases where the joints have to withstand stresses arising from special method 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 the service bolts for this purpose. Upto maximum of 40% 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 turn

bolts. The position and number of the drifts and bolts will be intimated by the Engineer. The condition of clause 20.1 must be observed and the bolt fully tightened up as soon as the joint is made.

Where the manufacturing of girders has been, the erection shall be done in accordance with **Appendix III of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001.** However, if the Contractor desires to adopt any other method of erection, he/she shall submit the scheme and obtain the approval of the Engineer. It shall be ensured that when in position, the girder has the camber as per drawing.

Emergency Jointing: - In the event of an emergency arising such as the staging is in danger of being carried away by floods before the rivetting can be completed, the joints shall be made secure by filling 40% of the holes with cylindrical drifts and equal number with service bolts fully tightened.

20. **Erection and 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 Purchaser, 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 subject 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 out 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.

21. **Bearings and Anchorages**

Bed plates shall be set to the required level and fixed accurately in position by giving full and even bearing by setting them on a layer of cement sand and cast iron chips as approved and directed by the Engineer.

The Contractor shall drill the holes where necessary and set the anchor bolts. The bolts shall be set accurately and fixed with cement grout or any other grouting material as approved by the Engineer completely filling the holes.

22. **Rivets and Rivetting**

The dimensions on the drawings referred to the diameters of the rivet holes and their finished rivets. The rivet holes shall be 1.5mm greater than the diameter of the rivet bars used. The rivets shall be made toIS:1929. The shanks of the un driven rivets shall be made of a length sufficient to fill the holes thoroughly and form the head. The clearance i.e. the difference in diameter between the rivets measured under head before being heated and the rivet hole shall not be Less than 0.75mm. Before riveting is commenced, all works shall be properly bolted so that the sections rivetted are in close contact throughout. Rivets shall completely fill the holes and shall be machine driven by means of pressure or percussion riveters of approved design.

All rivets shall be properly heated to straw heat for the full length of the shank, firmly backed and closed. The head of the rivet, particularly in long rivets, shall be heated more than the point and in no case shall the point be heated, more than the head. Sparking or burnt rivets shall not be used. Where it is impossible to back up by normal method of holding up, 'double gunning' may be resorted to. Alternatively pneumatic holding device may be used.

Gauges for rivet dimensions and contours shall be provided by the Contractor for the use of the Inspecting Officer.

Rivets when driven shall completely fill the holes, have the heads concentric with the shanks and shall be in full contact with the surface. Driven rivets when struck sharply on the head with the 110-gm. Rivet testing hammer, shall be free from movement or vibration.

While riveting built-up member's great care should be exercised to ensure that the set of holes for field rivets in each flange of the built-up member, is aligned dead-square in relation to that in the other flange and not 'aborrated'. Use of assembly fixtures shall be made to ensure this.

All loose and burnt rivets and rivets with cracks badly formed, eccentric or deficient heads shall be cut out and replaced. Permissible deviation of driven rivets shall be as per **Appendix IV of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001**. Rivets shall also be cut out when required for the examination of the work. Actual method of cutting out shall be approved by the Engineer. Recupping and caulking shall in no circumstances be resorted to.

Riveting shall not be started until such time as the Engineer has personally satisfied himself that the alignment of the girders is correct, the verticals plumb laterally, the camber according to that shown on the camber diagram with camber jacks screwed tight, all the joints and cover plates well up, service bolts tight and field rivet holes coinciding. Special care should be taken that service bolts are frequently re-tightened as the riveting proceeds.

All field rivets shall be tested as directed by the BBJ / Railway's Engineer.

Where practicable all riveting shall be done by pneumatic or hydraulic riveting machine. The

working pressure to be employed when using pneumatic or hydraulic tools shall be approved by the Engineer. Hand riveting shall only be done when sanctioned by the Engineer. In such cases, means shall be adopted to ensure the rivets being used in their entire length so as to fill the rivet holes completely, the snap being used only to give the correct form of head. When all the rivets of joints have been finally passed, they shall be painted as under.

a) One coat of ready mixed zinc chrome primer toIS:104 followed by one coat of ready mixed paint red oxide zinc chrome primer to IS:2074
b) Finishing coat as per directed by the BBJ / Railway's Engineer.

23. Field Rivets, Bolts, HSFG Bolts, Nuts and Service Accessories

The work is to include supply of all units, bolts, HSFG Bolts, nuts, washers etc. required to complete erection at site with an allowance for wastage etc. of12.5% of the net number of field rivets, bolts and washers required subject to a minimum number of five in each item.

The Contractor shall be responsible for supplying site rivets/ HSFG Bolts of approved length. The length of such rivets/HSFG bolts shall be verified by snapping a few rivets/ HSFG bolts of each length in the presence of the Inspecting Officer. In the case of rivets with long grips (with grip exceeding 6 times the diameter) specimen rivets on the test piece shall be cut to see if the holes are totally filled even though the rivets are tight under the usual hammer tests.

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 rivets per span in each size(this includes wastage).The Purchaser may however, specify a reduction in the quantities of service bolts etc. if more than one span of each type is ordered.

24. Smithed Work

All joggles shall be performed by pressure. Craned sections or knees can be formed by forging or by gas cutting and welding by any approved electric arc process. Any bending, forging, cutting or welding shall be carried out in such a manner as not to impair the strength in the metal. Forging shall be annealed as indicated in the drawing. If drop forging through dies is resorted to, excessive forging in one operation shall be avoided. Where necessary, a series of intermediate stage dies shall be manufactured and used.

25. 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 dioxide 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.
Welding procedures:-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 sequence, 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 proform a given at **Appendix-V of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001.**

Site welding should not be undertaken except in special circumstances with the approval of the Chief

Bridge Engineer. Site welding should be confined to connections having low stresses, secondary members, bracings etc.

Manual metal arc welding may be done taking adequate precautions as per IS:9595 and under strict supervision.

26. Sequence of Welding and Weld Pass

For fabrication of welded composite girders, channel shear connectors shall be welded on top flange plate prior to assembly of I-section. This facilitates correction of any distortion of flange plate developed during the welding of channel shear connectors.

In making a typical I-section four fillet welds are to be made. The welding sequence to be followed is indicated by number 1 to 4 as shown in the **Fig. 3 of IRS Specification for Bridge Fabrication and Erection of steel girders serial No. B1- 2001.**

Whenever a square butt weld in a 10 or 12 mm thick plate is required to be made, the sequence to be adopted is shown in **Fig.3 of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001.**

27. Bolts, Nuts and Washers

Bolts, Nuts and Washers shall be in accordance with the following specifications:-
(i) Black hexagonal bolts to IS:6639 and Nuts to IS:1363.

(ii) Precision and turned bolts with nuts and hexagonal screws to IS:1364.

(iii) PlainwasherstoIS:2016 and IS:5369.

(iv) Springwashers-IS:3063.

(v) Taper washers-IS:5372 and IS:5374.
Manufacture, workmanship, Marking, Packing etc. For Bolts and Nuts shall comply with the requirements of IS:1367.

Where the head and nuts bear on timber, square washers having the length of each side not less than three diameters of the bolt and the thickness not less than one quarter of the diameter shall be provided. Steel, wrought iron or malleable cast iron taper washers shall also be provided for all heads and nuts bearing on beveled surfaces.
For black bolts a clearance (difference in diameter) of 1.5mm for all sizes of bolts shall be allowed.

Where turned bolts are required they shall be carefully turned and shall be parallel throughout the barrel. Holes for turned bolts should be 1mm under drilled in shop and should be reamed at site to suit the diameter of the turned bolts.

The following limits of tolerances, shall be permitted upon the diameter of the shank of turned bolts and of the holes which they are to fit:

Limit of tolerance	**Shank of bolt(mm)**	**Hole(mm)**
High	0.000	+0.125
Low	-0.125	0.000

The shank of each turned bolt shall be of such a length that it is in full contact with the work, throughout, the screwed portion being made at least 1.5mm less in diameter than the shank or to suit the next smaller size of screw thread. The shank portion shall be joined to the threaded portion by a 450 chamfer within the thickness of the washer. Washers with perfectly flat faces should be provided with all turned bolts.

The washers under the nut shall have a hole of 1.5mm larger in diameter than the shank of the bolt and shall have a thickness of not less than 6mm so that the nut, when screwed up, shall not bear on the shoulder of the bolt.

Supply of High Strength Friction Grip (HSFG)Bolts Reference Codes:
(i) IS1367 (Part6)–1994 (reaffirmed2004)–Mechanical Properties and test methods for nuts with specified proof loads
(ii) IS1367 (Part8):2002–Prevailing Torque type Steel Hexagon Nuts–Mechanical and Performance Properties.
(iii) IS1367(PartXII):1983(reaffirmed2001)–Phosphate Coatings for Threaded Fasteners.
(iv) IS3757–1985(reaffirmed2003)–Specifications for High Strength Structural Bolts.
(v) IS4000:1992–High Strength Bolts in Steel Structures–Code of Practice.
(vi) IS6623:2004-High Strength Structural Nuts-Specifications
(vii) IS6649:1985- Specification for Hardened and Tempered Washers for High Strength Structural Bolts and Nuts.

Hierarchy of Codes: The hierarchy of codes shall be as follows:
(i) Provisions of IRS codes.
(ii) Where IRS codes are silent, relevant IS codes.
(iii) Where both IRS and IS codes are silent, relevant EN codes.

Definition: HSFG bolts are high strength structural bolts which have been tightened such as to induce predefined tension in the bolts hank. Provisions in this Code apply to non–galvanized Bolts of dia.M12 to M36 only.

Types of Bolts: For the purpose of HSFG connections, only high strength structural bolts of two property classes:8.8 and 10.9 can be used. Bolts shall conform to IS 3757. The bolts shall have the following characteristics

(i) **Identification:** The property class of bolts (8.8 or 10.9) shall be embossed or indented as 8S or 10S respectively on the top of head along with the manufacturer's identification symbol. Alternately, marking '8.8S' or '10.9S' are also acceptable. The suffix 'S' here denotes that the bolt is high strength structural bolt with a large series hexagon.

(ii) **Length:** The length of bolt shall be chosen such as to hold the steel members in position, with provision for the nut, washer(s) and some projection beyond the bolt. Along with the overall length of the bolt, the thread length has to be specified.Atleast4 full threads shall remain clear between the bearing surface of the nut and unthreaded part of the shank Further, minimum one full thread pitch must protrude from then after tightening.

(iii) The minimum length of bolt shall be worked out on the basis of maximum grip length (covering ply thicknesses and all washers) plus an additional allowance as per table 1 of IS:4000.

(iv) Maximum grip length of all plies, including packings and packing washers, shall not exceed 10 times the nominal diameter of the bolt.

(v) **Surface Finish:** All bolts shall be supplied with coating consisting of zinc phosphate that is used in conjunction with suitable oil or rust preventive type as per IS 1367 (Part XII).

Nut: Each bolt shall be tightened using a high strength nut, conforming to IS 6623. The nut has to be strong enough to be able to impart the necessary torque to the bolt and also withstand the force during the life of the structure. Further, the threads in nut shall be matching with the threads in the HSFG bolt and the nut shall be free running on the threads of the HSFG bolts. Nuts shall have following characteristics:

(i) **Property Class:** For HSFG bolts, the property classes to be used are 8 and 10 as specified in IS1367 (Part6), suitable for bolts of property class 8.8 and 10.9 respectively. Normal height of nut shall be more than 0.8 times the nominal bolt diameter.

(ii) **Identification of Nut:** The nuts have the following markings:

(a) Manufacturer's identification symbol.

(b) Property class, marked as '8S' or '10S'. (The suffix 'S' denotes a high strength structural nut with a large series hexagon.) Alternately, '8.8 S' or '10.9 S' are also acceptable. The marking shall be either on the top or the bottom face of double chamfered nuts and shall be either indented or embossed on non bearing surface of washer faced nuts.

(iii) Surface finish and coatings of Nut: All nuts shall be supplied with coating consisting of zinc phosphate that is used in conjunction with suitable oil of rust preventive type as per IS: 1367 (Part XII).

(iv) **Position of nut in bolt:** Nuts shall be provided in bolts preferably as follows:

(a) **In girder web:** Towards outside of the girder.

(b) **In flanges:** Towards bottom (Except when in composite construction).

(c) **In composite construction:** Towards inside of concrete.

(d) **In bracing:** Towards the rolled section side so that the space for rotation of the nut is not readily available.

(e) Where **Tapered washer** is used, the nut shall preferably be on the other side.

Washer: Annular rings which are provided between the bolt head/nut and the members being joined are called washers. Washers for HSFG bolts shall conform to IS 6649.The washers have the following characteristics:

(i) Types: Three types of washers have been specified in IS6649, clause 2:

a) Type A: Plain hole circular washers.

b) Type B: Square taper washers for use with channels (60taper)

c) Type C: Square taper washers for use with I-beams (80taper)

Identification: Type A washers shall be identified by provision of two nibs (small projections) and manufacturer's identification symbol in indented character. The type B and C washers shall be identified by the type identification symbol, B or C and the manufacturer's identification symbol.

(ii) Categories of washers:

a) **Plain washer:** Plain washers are used as per provisions of clause28.10.2 where other types of washers are not suitable. HSFG bolts shall be provided with minimum one washer.

b) Packing washers: If the bolt is longer than required, plain washers may be used as packing washers also. However, the maximum number of packing washers shall be limited to 3, with maximum total combined thickness of 12mm.

c) **Tapered Washer:** Where the angle between the axis of bolt and the joint surface is more than 3 degree off normal, a tapered washer shall be used against the tapered surface. Non rotating surface shall preferably be placed against tapered washer.

d) **Direct Tension Indicators (DTI):** The Direct Tension Indicators are special type of washers with projections which get pressed when tension is applied. The pressing of projections to required level indicates that the required tension has been applied in the bolts. DTIs have multiple projections, between which the feelergaugeistobeinsertedtocheckifthebolthasbeensufficientlytightenedor not. The projections shall be kept in the direction of nut/head of bolt and not towards member.

(iii) Calibration of Direct Tension Indicator: Before the DTI are brought to site, the same shall be tested in the presence of engineer. Three nos. bolts of similar diameter and property class as to be used in the work shall be taken and installed with DTI. The installation procedure to be followed shall be similar to the one given for plain washers. On full tightening, the projections on DTI washers shall meet the requirements of checks specified after second stage tightening using DTIs. Alternately, calibrated load cells may be used to check the calibration of DTI washer. **Only the DTIs which satisfy the calibration shall be brought to site for work.**

(iv) Surface Finish: All washers (except Direct Tension Indicators i.e. DTIs which may have any surface finish, as specified by manufacturer, with condition that the surface finish shall be compatible with the metallurgy of the steel structure and the HSFG bolt/nut) shall be supplied with coating consisting of zinc phosphate that is used in conjunction with suitable oil of rust preventive type as per IS 1367 (Part XII).

Fabrication and Assembly of High Strength Friction Grip(HSFG)Bolts
Holes for HSFG Bolts: Normal holes in the steel members being connected by the rivets shall be used for HSFG bolts also, subject to the following:
(a) **Making of holes:** The holes shall be made by drilling only.

(b) **Nominal Diameter of Hole:** The nominal diameter of hole shall be 1.5mm more than the bolt diameter for less than 25mm bolt and 2mm more than the nominal diameter of the HSFG bolt for larger diameters.

(c) **Oversize Holes:** In case the bolts are to be provided in existing structure, the maximum size of hole shall not exceed 1.25 dord+4mm whichever is less.

Number of washers and their fixing:
(i) DTIs are very good method of ensuring that the bolts are tightened properly and this method of tightening shall be preferred over the method with plain washers. Hence DTI washers shall be preferably used. If there is some problem with availability of DTIs, plain washers may be used for installation of HSFG bolts after approval of SAG officer in-charge of the work.

(ii) The DTIs used shall be the ones which are compatible metallurgically and also suitable for the bolts of property class 8.8 and 10.9. Suitable markings identifying the bolt manufacturer, property class of DTI and its diameter shall be engraved suitably on the DTI.

(iii) Number of washers to be provided:
(a) Two washers shall be provided, one against head and one against the nut.

(b) **One DTI shall be used in one bolt.** Incase DTI is being provided, the same will count as one washer i.e., one DTI and one plain washer shall be provided.
(c) DTIs shall normally be provided below the head of the bolt (with projections towards bolt head) in case nut is rotated. In case the bolt is to be rotated, DTI shall normally be provided under nut (with projections towards nut).In case other side is not accessible form measuring projection gap in DTI, the DTI may be provided under nut which is being rotated. In this case, an additional washer shall be

Provided on the DTI side to protect the projections from damage due to the abrasion during bolt tightening.

Surface preparation for steel interface before providing HSFG bolts:
The steel interface between the plies which form a joint having HSFG bolts shall have special surface preparation so that sufficient slip factor is available. The surface preparation shall be as assumed by designer in design, based on slip factor specified in Table XIII of Steel Bridge Code. The following surface preparation is recommended:

(i). **New construction:** The inter face between the plies which are connected together by the HSFG bolts shall be "Aluminium metalized without any over coating".

(ii). **Existing structures:** The interface of plies which are to be included in the HSFG bolts shall be cleaned by wire brushing/flame cleaning equivalent to the surface specified in IRBM para 217,1(b),(i) to (iv). The surfaces shall be cleaned to remove all loose rust and paint layers (Only isolated patches of coatings/rust can remain). If, however, in existing structures, rivets are to be replaced by bolts but no surface preparation is possible, the slip factor shall be suitably reduced as per Table XIII of Steel Bridge Code.

Personnel for Tightening: The tightening of HSFG bolts is a technical procedure. Only trained personnel who understand the procedure shall carry out the installation of HSFG bolts. Before any person is deployed for installation, his knowledge of the procedure for tightening shall be checked and if found satisfactory, a competency certificate shall be issued by BBJ / Railway. The competency certificate once issued shall be valid for six months. Any person deployed for installation of HSFG bolts must possess a valid competency certificate.

Procedure for tightening: Bolts shall be tightened so as to impart bolt tension as specified in para 7.12.6 of IRS Code Of Practice For The Design Of steel Or Wrought Iron Bridges carrying Rail, Road Or Pedestrian Traffic. The following steps shall be followed for tightening of bolts:
(i) The holes shall be brought in alignment by using drifts etc. such that the bolt threads are not damaged during insertion of bolts. Drifting shall not distort the metal or enlarge the holes.

(ii) The members being joined shall be held in position by insertion of few HSFG bolts (tightened to first stage (as defined in para 28.10.5) only).These bolts shall not be

Tightened to second stage as defined in para 28.10.5 till all the bolts in a joint are inserted and tightened to first stage.

(iii) After the alignment/ geometry of members is verified to be correct as per drawings, balance bolts shall be inserted and tightened upto first stage of tightening. The drifts inserted as above shall also be replaced by HSFG bolts one by one.

(iv) **Clearance between plies:** The final tightening shall not proceed until the gap between the plates has been closed. Residual gap, if any, shall be less than 2mm at edges. There shall, however, be no gap in the central portion. In case the central portion is not in close contact or gap at edges is more than 2mm, straightening of members may be done after opening out the bolts inserted and the entire procedure i) to iii) above shall be repeated.

(v) **Sequence of tightening:** During tightening of bolts also, the steel members can continue to deform and hence the tightening of subsequent bolts can lead to loosening of already tightened bolts. In order to minimize the loosening of already tight bolts, tightening shall be done starting from the stiffest part to the free edges. Stiffest parts of joint are generally towards the centre of the joint.

Procedure for Installation of HSFG Bolts Using Direct Tension Indicator:
The tightening is done in two stages so that the bolts already tightened do not get loose when the subsequent to bolts are tightened. The procedure shall be as follows:

(a) **First Stage of Tightening:** As a first stage, all bolts in the joint shall be tightened to 'snug tight' condition in proper sequence for tightening. Snug tight condition means the nut is tightened using an ordinary wrench by an average worker, applying maximum force on the wrench. This stage is required to bring the plies in close contact.

(b) **Checks after First stage tightening:** After first stage of tightening, the joint shall be checked to see if the plies are in close contact and the clearances are not exceeded.

(c) **Second Stage of Tightening:** During the second stage of tightening, torque wrench is used to tighten the bolts until the indentations on the DTI indicate full tightening. The bolts shall be tightened in proper sequence of tightening.

(d) **Checks after Second stage tightening:** 0.40mm thick feeler gauge shall be used to check 100% of the bolts for proper tightening. If 0.40mm thick feeler gauge cannot be inserted in the space between indicator positions on a DTI, it is called a 'refusal'. If a 0.10mm thick feeler gauge cannot be inserted in the space between indicator positions on a DTI, it is called 'full compression of the indicator'. The joint/bolts shall be said to be properly tightened if the following condition is met with:

Number of indicator positions in DTI washer	Minimum number of feeler gauge refusals*

4	3
5	3
6	4
7	4
8	5
9	5
*No more than 10% of the indicators in a connection bolt group shall exhibit full Compression of the indicator.	

Procedure for Installation of HSFG Bolts without DTI washers: The tightening shall be done in two stages so that the bolts already tightened do not get loose when the subsequent bolts are tightened.

i. **First Stage Tightening:** In the first stage, a calibrated wrench with an accuracy of ±10% shall be set to 75% of the torque computed for the complete tightening of the bolt. The torque computed shall be as per manufacturer recommendation, duly certified to impart the bolt tension specified in para 7.12.6 of IRS Steel Bridge Code. All the bolts in the joint shall be tightened to this torque in proper sequence for tightening. After checking all bolts after the first stage, permanent marks shall be made with suitable marker on the bolt as well as nut steel member to indicate the relative position of the two. The mark shall be such that the same shall be visible for inspection up to 1 year after the date of installation.

ii. **Checks after first stage:** After the first stage of tightening, following shall be checked:
a) The steel members that make up the plies of the joint with HSFG bolts shall be checked for proper contact as specified.

b) 10% bolts, subject to minimum 2 per joint shall be tried to be rotated with a separate calibrated torque wrench set at 75% of the proof load for the bolt. Any boltturningbymorethan150duringthe check shall be rejected. If the improperly tightened bolts thus found are more than 5 but less than 1% of the total, another 10% of the bolts shall be checked. If the total improperly tightened bolts thus found exceed 1% of the total, the tightening procedure and personnel involved shall be reviewed, the torque wrench used for tightening shall be calibrated afresh and the entire lot shall be checked for tightness.

iii. **Second Stage Tightening:** The bolts tightened to first stage shall be turned by a further amount in proper sequence of tightening as specified below:

Total nominal thickness "t" of parts to be connected (including all packing and washers),d = dia of bolt	Further rotation to be applied, during the second stage of tightening	
	Degrees	Part turns
t<2d	60	1/6
2d≤t<6d	90	1/4
6d≤t≤10d	120	1/3

iv. **Checks after second stage tightening:** After the second stage of tightening, following shall be checked:
a) 100% bolts shall be checked and certified to have been turned through the requisite amount by verifying the permanent marks on the bolt and the nut/steel member.
b) 1%of the bolts, subject to minimum of 10per size of bolts shall be checked for gross under-tightening as per procedure given in Annexure-D of IS 4000.

Painting during initial installation: In case of HSFG bolts with "Direct Tension Indicating" device, the final coat in field applied on complete structure may be applied on HSFG bolts also. In case part turn method of tensioning is used without "Direct Tension Indicating" device, the HSFG bolts shall not be painted and the permanent location marks made on the bolts shall be visible after 1 year of

installation.

Painting in service: HSFG bolts shall be painted as per normal painting schedules and painting methodologies as specified in the Indian Railways Bridge Manual for the girder as a whole.

Re tensioning of bolts:
i. The HSFG bolts are tightened beyond yield stress level and undergo plastic deformation once tightened fully. If the bolt is opened out after complete tightening, its length gets increased permanently as compared with the initial length. The initial few threads which transfer the load from the nut to the bolt suffer the maximum damage. Therefore, a bolt completely tightened shall not be reused under any circumstances.

ii. A bolt which has been snug tightened or partially tightened (tightened to first stage of tightening) and then opened out will not be considered to have been fully tensioned and reuse of such bolt will be permissible in the same or different hole, as required.

Specifications of torque wrench: Except for works of minor nature where number of HSFG bolts to be installed in very less, only mechanical torque wrenches (pneumatic, hydraulic, electronic etc.) shall be used for tightening of bolts. For small quantum of work, manual torque wrenches may be used with permission of site-in-charge.
Calibration of torque wrench: Calibrated torque wrenches, accompanied with a certificate to the effect, shall be brought to site. Torque wrenches shall be calibrated periodically at least once in a year to an accuracy of ±10%.These shall be recalibrated in case of any incidence involving the wrench during use resulting in heavy impact(such as fall, mishandling etc.,)or if the joint is found to have been improperly tightened using the same. The procedure for calibration of torque wrench shall be as specified by the manufacturer.

Connecting Pins
All connecting pins shall be finished accurately to gauge and parallel throughout, straight and with smooth surface entirely free from flaws and of sufficient length to ensure that all parts connected thereby shall have a full bearing on the pin.
Theyshallbeturnedtoasmallerdiameterattheendforthethreadanddrivento Place with a pilot nut, where necessary to preserve the thread.

28. Pin Holes
Pin holes shall be bored smooth straight and true to gauge and at right angles to the axis of the member. Boring shall only be done after the member has been riveted up and the diameter of the pin shall not be less than that of the hole by more than 0.5mm.

29. Bearing and Expansion Gear
All steel bed and bearing plates or plates over saddle castings, shall be made perfectly level and all rivet heads on their bearing surfaces shall countersunk and dressed flush. The saddles, knuckle-bearers and roller bed - plates shall be planned on all bearing surfaces and elsewhere as indicated on the Contract Drawings and all bolt-holes shall be drilled. The bottom edge of ribs should be machined and welded to the bottom slabs after which the top edges of the ribs should be machined as a whole and the top plate welded. Subsequently the top and bottom surfaces should be machined to the specified tolerances as given in Appendix VI of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001. Generally in connection with the bearing gear all meeting surfaces including the sides of the roller frames, shall be machined, all bolts except anchor bolts turned and fitted, all washers faced, the rollers knuckles and pins polished to smooth surface and the whole finished in the style of first class machined work.

Tolerances shall be as specified in Appendix VI of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001and shall be shown on the drawings.

30. Erection in Contractor's Works

The work shall be temporarily erected complete at the Contractor's Works for inspection by the Inspecting Officer, with the exception of such riveting as has to be done at site, so that accuracy of fit and perfection of workmanship may be assured. The work shall be put together with sufficient numbers of parallel drifts or turned bolts or both to bring the pieces into place. When so erected all holes left to be filled at site shall be so fair that a parallel gauge turned to a diameter 0.8 mm less than that of the hole, of a length equal to the depth of the hole, can be passed through them without difficulty. No drift shall be used anywhere in the work larger in any part than the hole in which it is to be driven. Holes for turned bolts, which have been 1 mm under drilled in shop, should be reamed at site by the erecting agency.

31. Interchangeability

Every span is to be temporarily erected complete in Contractor's works adopting the method of giving camber as explained in clause 32 and all parts as marked to their place, unless the whole of the work is made completely interchangeable by the use of steel jigs and hard steel bushes controlled by master gauges, in which case the first span must be completely erected to test the accuracy of the templates. Further spans or parts pan assemblies built from parts selected at random by the Inspecting Officer shall be erected from time to time to check the accuracy of the work as the Inspecting Officer may require.

If the work is considered interchangeable by the Inspecting Officer a simplified scheme of marking will be permitted, i.e. all pieces which are identical shall bear one distinguishing mark irrespective of the span to which they belong. Should the interchangeability not to the satisfaction of the Inspecting Officer, the whole of the spans must be erected complete and all parts marked to their place without additional charge. The tenderers must state in their tenders whether they intend to adopt complete interchangeability or not. Under special arrangement with the Purchaser, it shall be permissible for approved portions of the work to be dispatched before complete erection of the first span, provided the Contractor satisfies the Inspecting Officer that such portions of the work are strictly interchangeable and will assemble correctly and accurately in the complete structure.

32. Camber

In order to ensure that the fabrication and erection of main girders shall be such as to eliminate secondary stresses in the loaded span, the nominal length (i.e.the lengths which will give no camber) of member shall be increased or decreased by the amount shown on the camber diagram supplied by the Purchaser.
For setting of the angles of intersection of the chords and web members and also for templating the gusset, full size of panels with nominal lengths of the members, shall be used. Similarly, the machining of all chords butts shall be to suit the nominal outline.

The procedure for erecting the span at Contractor's work shall be as specified. The site riveting holes shall be riveted or bolted and drifted as specified in Appendix III of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001.

When supported on blocks or staging's, the girders shall be erected to the camber specified in the fabrication drawings according to which the girders have been manufactured. A camber diagram indicating the relevant height of each panel point when erected on blocks at the manufacturing works shall be supplied by the Engineer.
The cambering of the main girders along with pre–stressing, when all panel points are supported on the blocks or staging's, shall be carried out in accordance with Appendix 'A' of Steel Bridge Code.

Special methods of erection will require special erection drawings approved by the Engineer, which must not be deviated from. In the case where the girders are erected on yielding supports such as a service span, due allowance shall be made for the anticipated yield when the camber blocks are set out. Frequent checks shall be made of the camber of girders during erection and care taken to see that the camber as per drawing is obtained when the girder is completely assembled. When span is

supported on ends and intermediate supports are removed the dead load camber shall be recorded and entered in bridge register. This will provide the reference to compare the camber checked during technical inspection to ascertain the loss of camber.

33. Testing

The Inspecting Officer shall be empowered, at his/her discretion to make or have made under the supervision, any of the tests specified in the specifications mentioned herein In addition to such other tests as he/she may consider necessary, at any time upto the completion of the contract and to such an extent as he/she may think necessary to determine the quality of all materials used therein. In doing so, he/she shall be at liberty under any reasonable procedure, he/she may think fit to select, identify, have cut-off and take possession of test pieces from the material before, during or after its being worked up in to the finished product.

He shall also be empowered to call for a duly authenticated series of mechanical tests to be obtained from the maker for this material used in the work and to accept the same in lieu of other tests to the extent he/she deems fit. The Contractor shall supply the material required for the test pieces and shall also prepare the test pieces necessary.
The test shall be carried out by the Contractor, for which Contractor shall provide all facilities including supply of labour and plant. Inspecting officer may at his/her discretion direct the Contractor to dispatch such tests pieces as he/she may require to the National Test House or else whereas he/she may think fit for such testing purposes.

34. Check on Tests Made at Contractor's Work

The Inspecting Officer may at his/her discretion, check test results obtained at Contractor's work by independent tests at National Test House.
The Inspecting Officer 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 Inspecting Officer'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.

35. Analysis

The Contractor shall supply authenticated copies of analysis of any materials used in the contract when required to-do so by the Inspecting Officer who shall be empowered to accept them to the extent he/she thinks fit. In addition to the above samples may, at the Inspecting Officer's discretion be subjected to complete analysis at the National Test House or elsewhere as the Inspecting Officer may determine, the cost of the same to be borne by the Purchaser.

36. Inspection-General

The Inspecting Officer shall have free access to the works of the Contractor at all reasonable times and shall be at liberty to inspect the process of manufacture at any such time and to rejection whole or part, any work or material that does not conform to the provisions of this Specification and may order the same to be removed, replaced or altered at the expense of the Contractor. All gauges and templates necessary to satisfy the Inspecting Officer of the complete interchangeability of parts must be supplied by the Contractor free of cost.

37. Oiling, Painting and Metalizing

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.

When so specified by the Purchaser, the whole of the work except machined surfaces shall be given protective coating using one of the systems of painting or metalizing as per code. 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.

For all locations, for all types of new steel girder bridges (including all components) the protective coating by metalizing with sprayed aluminum as given in the Appendix VII of IRS Specification for Bridge Fabrication and Erection of steel girders serial No.B1-2001 followed by painting as per paintings schedule given below may be applied:

(i) One coat of etch primer to IS:5666.
(ii) 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.
iii) Two coats of aluminum 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 toIS:2074 before being assembled for riveting/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 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.

38. Name Plate
A neat casting bearing the name of the BBJ, the place and year of manufacture, drawing number, the contract number and the standard of loading to be specified by the Purchaser shall be bolted conspicuously on each span. The drawing of the name plate shall be approved by the BBJ / Railway Engineer.

39. Erection Mark
Every portion of the work shall be distinctly stenciled with paint with letter size not less than 10 mm for guidance in the erection in the field, and stamped with the letters specified in the drawings. In the case of non-interchangeable work, the system of markings hall be in accordance with the drawings prepared by the tenderer and approved by the Purchaser.

40. 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 the chord lengths, end posts and plate girders at the shipping, joints shall be protected and stiffened so as to prevent damage or distortion in transit as the Inspecting Officer may direct.

All threaded ends and machined surfaces are to be efficiently protected against damage in transit. The parts shall be sent out in lengths convenient for transport.

All straight bars and plates except small pieces are to be sent out in convenient bundles temporarily riveted or bolted together or bound with wrought iron or suitable wire as the Inspecting Officer may direct. All rivets, bolts, nuts, washers, plates under 300 mm square and small articles generally are to be packed separately for each span in cases each weighing, when full, not more than 350kg, or in strong petroleum casks, or in barrels approved by the Inspecting Officer. If not entirely filled by the contents the space left shall be closely packed with woods having or other suitable material. Bolts and rivets of different sizes shall be separately packed in bags, each bag having a label indicating its contents. A list of the contents shall be placed in the top of each case or cask.

In the case of imported material all cases shall be made of 32 mm boards with ends nailed with 90 mm wire nails strengthened by battens and 38 mm x 1.6 mm (No. 16 BG) hoop -iron and made thoroughly secure for transit to India. All casks shall be in sound condition, and if not entirely filled

by the contents the space left shall be closely packed with wood-wool or other suitable material. The heads shall be firmly secured by means of hoops in the usual way, and in addition each head shall be further secured by a strong wooden batten and not less than two strips of 1.6mm (No.16 BG) hoop-iron passing over the head and nailed to the staves on both sides. The hop-iron shall be longenoughtopassovertwohoopsoneachsideofthecaskandbenailedinsuch a manner that the hoops cannot slack back. Bolts and rivets of different sizes shall be packed in a separate canvas bags, each bag having a label indicating its contents. End field holes to be bolted in case of members having split in plate and channels.

41. Dispatch or Shipping Marks

Each package, case or bundle is to have clearly stenciled on it in good oil paint the address as stated in the order of contract, gross and net weight description of contents and such marks as may be required by the Purchaser must be shown against each item in the invoice. The Contractor is to provide necessary stencil plates for marking. Every piece of bundle shall be marked and in the case of material (shipped to India) all cases or casks shall be clearly cut or branded, not merely painted, with their net and gross weights and with such shipping marks and other particulars as the Inspecting Officer may direct and each bundle shall also have a metal label securely attached with wire stamped with similar marks. The marking shall be done with thick oil paint and in such a manner that it cannot be washed of for obliterated.

42. Loading

All trucks or wagons are to be loaded to as near their full capacity as is consistent with safe transport. While loading the material in wagon, truck or trailer, care should be taken that heavier material is loaded first and lighter material is kept on top so that lighter material is not damaged due to heavy weight. While transporting the material by road, adequate safety precautions shall be taken as per extant instructions.

The Contractor shall apply all dunnage and lashing required to hold the material securely in position free of charge. While handling any girder or girder component it shall be ensured no damage to material takes place in the form of dent/cut mark etc. Wooden blocks, rubber pads shall be used to avoid direct contact between materials to be handled and handling equipment.

43. Weigh to Steel Work for Payment

Any steel work the weight of which differs by more than 2.5% from the calculated weight determined from the nominal weight of the sections shall be liable to rejection.

a) Payment shall be made on the tendered weight to be calculated in accordance with the nominal weight of the sections as specified on the contract drawings. An addition in weight for welds/HSFG Bolts and rivet heads should either be specified in the schedule or be made as follows: 3% in case of riveted or composite (riveted /bolted and welded) work ; and

b) 1% in case of purely welded work.

Should the actual weight fall short of the calculated weight by more than 2.5%, the material if accepted, will be paid for the actual weight only. Should the actual weight exceed the actual calculated weight, payment will be made for calculated weight only.

No separate payment shall be made for the items mentioned in clause 24.

In the even to dispute arising as to the weight of a portion of steelwork, a weighment shall be made in the presence of the Inspecting Officer.

44. Quantities

In case where the estimated quantities are given with the schedule, it must be understood that the Purchaser will not be responsible for their accuracy and if the Contractor makes use of them in preparing his/her tender, he/she does so at his/her own risk, as he/she will not be entitled to make any claim or demand nor to raise any question whatsoever, on account of any error or miscalculations in or misunderstanding of the said quantities, as these are given for the convenience of the Purchaser.

45. Tracings and Printings

Excepting in the case of standard spans fabricated without any modifications to the standard drawings the Contractor shall supply free of charge, one set of neatly executed tracing on linen. They shall be fully dimensioned and contain all erection marks, notifications as to the colour the work has been printed, the name of the Contractor and any alterations from the contract drawings, which may have been made in executing the work. The drawings shall conform to standard sizes as given in IS:962 and shall not exceed A0 size. The drawings shall not be folded but rolled outwards on a roller, in addition to three sets of full size copies on strong paper made by an approved process.

46. Rivets and Bolts Lists
The Contractor shall also supply, without charge, three complete lists of the rivets, bolts, HSFG bolts, service bolts, washers and drifts required for erecting the work at site, showing the parts of the work to which the various rivets and bolts belong and having each item marked so as to indicate the particular case in which it will be found.

47. Photographs
If required by the Purchaser the Contractor shall also supply without charge, two sets of large well-executed, un mounted photographs of the first span of each description of plate girder or truss bridge when erected, taken from two points of view and showing the erection marking as clearly as possible Photographs of rolled beam, trough girder or trough plate girder bridges will not be required.

48. Attestation of Tracings etc.
The tracings, photographs and lists shall be examined and signed by the Inspecting Officer. They shall be supplied with the first installment of the work delivered.

49. Deviations from this Specification
Should a tenderer desire to depart in any respect from the provisions of this Specifications either on account of manufacturing practice or for any other reasons, he/she must do so in an alternative tender which may not be considered, with a covering letter explaining in detail each and every departure he/she proposes to make from the Specification.

Manufacturer's standard specification may be submitted but all discrepancies must be carefully drawn attention to, both in covering letter and in appendices to be annexed to the specification. The intention is to adopt manufacturer's standard equipment as far as possible but these standards must in all respects comply with the conditions of this Specification regarding safety from break-down, output, capacity, performance etc.

50. Alterations in 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 Purchaser prior to the commencement of the work or part of work nor shall the Contractor be entitled to any payment for orin 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.

51. Elastomeric Bearings:
Elastomeric bearings are to be supplied as per the Design of UIC -772-2R and testing shall be done as per IRC-83-1987 part-II with latest correction slips. Materials used in manufacture of bearings shall be confirmed to the specification indicated in IRC Code. Contractor has to submit the manufactures test certificate bearing the information contained in appendix-3 of IRC. In addition to this, physical testing shall be done either in IIT, DGS &D or any other Govt. Institution as indicated by Engineer-in-charge. Fixing of the bearing stop recast concrete surface may be done by application

of epoxy resin adhesive to interface, after specified surface preparation. The specification of adhesive material workmanship and Contract shall be approved by the Engineer. Supplying, Acceptance inspection& Testing, and Installation of Elastomeric Bearings will be also govern by para 22.3 of Indian Railways Unified Standard Specifications (Works and Materials) 2021.

52. GUIDELINES ON FABRICATION OF STEEL GIRDERS

The fabrication is governed by the provisions of;
i) Indian Railway Standard specification for fabrication and erection of steel girder bridges and locomotive turn-tables.(B1-2001).
ii) Indian Railway Standard Code of Practices for metal arc welding for structural steel bridges carrying rail cum road or pedestrian traffic (Adopted 1972 Revised 2001).

Engineer of contractors should also have good understanding of various provisions of above Railway codes other related codes and Guidelines on Fabrication RDSO-BS-110.

53. ITEM REQUIRING ATTENTION BY CONTRACTORS & ENGINEERS DURING FABRICATION OF STEEL GIRDERS

A. Approved drawing to be used for fabrication:

Field/Workshop Engineer associated with fabrication should have all the relevant drawings, Codes & Specifications with latest Correction Slips prior to the start of work. On the basis of structural drawings, fabrication drawings should be prepared by fabricator. Plate Girder Drawings to be checked for intermediate stiffeners whether riveted or welded.

B. Quality Assurance Programme (QAP) of Steel Girder Fabrication:

To ensure the proper quality of fabrication Quality Assurance Plan (QAP) is prepared. QAP must indicate stage wise manufacturing process covering various steps, tests, checks& their frequency, sampling plan, authority for grant of clearance etc. for all activities from inspection and testing of raw material to trial assembly and erection. The QAP must cover following aspects.
1. Brief Details of project
2. Contract Agreement No.
3. Loading Standard
4. Governing Specification
5. Drawing references
6. Roles and responsibilities of various agencies involved in fabrication, erection & inspection.

QAP is to be scrutinized and approved by the inspection agency. In case of welded girder it is to be done by RDSO, as per prevailing orders.
Field Engineer of the Contractor should ensure that work is carried out strictly as per the approved QAP and no deviation takes place from QAP. All the stages should be studied in detail, prior to start of work.

C. Scrutiny & Approval of Welding Procedure Spec. Sheet (WPSS) (final approval to be done by RDSO):

WPSS is process sheet indicating plate/section used, welding process, type of joint, welding consumables quality, welding parameters, acceptance standard, tests applicable etc. Field Engineer of the Contractor should ensure that welding is carried out as per approved WPSS. It is to be ensured that welding consumables to be used are from approved source and a proper record of their consumption is maintained. A sample Performa for record keeping of consumables is enclosed as Annexure –II of Guidelines on Fabrication of Steel Girder BS-110 issued by RDSO B&S Directorate.

D. Welding Procedure Qualification Records (WPQR) (final approval to be done by RDSO):
WPQR is the document indicating approval of various welders who are to be deployed for carrying out welding work for fabrication. It contains Name of the welder with photograph, qualification, experience, qualification tests and records for each welding process and joint, welding parameter.

Tests are conducted by RDSO Official from M&C Directorate before qualifying the welders and then approval is granted through WPQR. Field engineer of the Contractor should ensure that welding is done only by approved welders and no deviation takes place.

E. Raw Material and Gauge Certification

Inspection of Raw Materials:-Passing of raw material is done on the basis of visual inspection and lab test for mechanical properties, chemical composition, ultrasonic examination, Charpy Impact Test, lab test report etc. Rivets and other consumables like paint etc. should also be got tested from NABL labs as per relevant codes/specification.

All the required test should be got done through independent NABL Labs and compared with the mill test results given by the supplier before passing the material for use.
Material test certificate register must be maintained by Contractor as per Annexure available in IRS:B1-2001 (appendix-I,Performa-7) and signed by railway representative as well as fabricator. All angle/channel, rolled section to be used for open web girder fabrication shall be checked for rolling tolerance as stipulated in IS: 1852. In addition to above visual inspection shall be done to ensure that steel is free from surface defects like pitting, laminations, imperfect edges, twist, other harmful defects etc. and recorded in the register.

F. Item requiring attention before Fabrication of Girder.

F1. Inspection of Layout on template floor–Field engineer has to ensure that the Template floor is level. Nominal and camber layout are drawn with the calibrated steel tape. The certificate of calibration from a authorized agency should be kept in record. For squareness, diagonal measurements are also checked. It should be remembered that tape should not be changed during the various stages of measurement. Running measurement should be recorded with along tested tape having minimum length suitable for half span/full span measurement as per the case. 4lbs pullis to be applied for stretching the tape. Suitable device should be used for this purpose.

F2. Inspection of Jigs, Fixtures and Master Plates-Master Gussets should be checked on nominal layout and transfers of all inter section line/points to be done with great care and accuracy. If gussets are symmetrical then 1/4th or half hole marking is to be done and same will be transferred to complete the gusset marking. Dimensional Inspection of Jigs, Fixtures, and Master Plates used in manufacture of girder should be done very carefully to ensure accuracy. It should be remembered that jigs of main members of the open web girders are fabricated on the camber length with the adoption of the field holes at nominal length layout through master gussets.

F3. Layout of joints is drawn as per drawing on1:1 scale on a level ground to check for; i) Any infringement of rivets, adjoining edges etc.
ii) Position of holes in master plates for jigs as per layout.
iii) The bore of bushes shall initially have tolerances of -0mmto+ 1mm.Fairingof bushes with holes of master plate shall conform to tolerances of–0.13mmusing a 'GO' gauge of 0.13 mm less than hole diameter. Bushes of jigs during service should be maintained within acceptable limit (D+0.4mm) which shall be checked at regular intervals.

F4. Certification of Jigs, Fixtures and Master Plates-Stamping of Master Plates by the inspection official should be ensured prior to their use. The jigs should be checked by fabricator and field engineer from time to time for their wear and tear for maintaining accuracy during work.

G. Item requiring attention during fabrication of girder: Contractor's Field/Workshop Engineer should keep a watch and maintain proper record for-

(i) Ensuring Use of Approved Raw Material-Only raw material cleared originally to be used during fabrication.
(ii) Ensuring use of Approved Welding Consumables-Type of consumables, source, quality, approval status, grade, suitability for fabrication as per WPSS etc. to be frequently checked and recorded.
(iii) Ensuring use of Approved Welders- Checking of welders' certificate, records, skill and procedure

adopted for welding as per WPSS
(iv) Ensuring use of Approved WPSS & Welding Parameters- Checking welding parameters and equipment used for correctness of joint preparation etc.

Important Checks for Tack Welding:
i) Check that top & bottom flange plate are perfectly perpendicular with reference to web throughout the length of I Section.
ii) Check the squareness i.e. 90° angle between flange & web of top and bottom flange plate to avoid out of squares flanges.
iii) Check with filler gauge throughout the length of top & bottom flange connection for uniform contact throughout the web plate.

Points requiring attention during full welding:
i) Thorough cleaning of tack welded member should be done with appropriate tool like wire brush, before shifting for full welding. Minimum width of 75mm throughout the length shall be cleaned to ensure that the surface is free from dust, mill scale, grease, oil and paint to ensure sound quality of weld.
ii) Full welding shall be carried out in flat position with SAW process as per sequence mentioned in WPSS/WPQR using manipulator/special welding fixture.
iii) The sequence of welding shall be shown in WPSS/WPQR marked as 1, 2, 3 & 4 in the order of welding.
iv) The welding should be done in proper sequence.
v) Minor welds/Inaccessible location welds shall be made by CO2 welding or other type of welding as per approved WPSS.

Radiographic Exam. Of Butt Weld Joints-Any butt welding provided as per approved WPSS should be subjected to radiographic testing by authorized agency only. The film should be preserved for examination, sensitivity, and defect interpretation and acceptance decision based on prescribed criteria.

Ensuring use of Approved set of Jigs & Fixtures-To permit the inter changeability of the components and ensure pre-stressing in open web girders and to avoid distortion, it should be ensured that only approved Jigs & fixture are used and proper clamping arrangement are provided in jigs/fixtures.

H. Item requiring attention after fabrication of girder: stacking of component should be proper and shipping mark is properly stenciled on component for identification**.**

Field/Workshop engineer should ensure that:-
While cutting the plates or other section the heat/cast mark should be transferred to all cut members while using these members for fabrication. Proper record of heat mark should be maintained/correlating it with the components of girder.
Visual Exam of Welds – Quality of weld, uniformity of weld bead, size of the weld, weld defects e.g. under cut, blowhole, porosity, spatter, crack etc. Should satisfy para 31 and Appendix C of welded bridge code of Railway.
Metallographic and NDT Exam of Fillet Welds - Macro etching on girder, run-on, run-off tabs for ensuring proper weld quality, Dye penetrate examination etc. should be arranged by fabricator, for independent inspection.
Structural and dimensional inspection-Dimensional check should be carried out by field engineer to ensure conformance to drawing dimensions including diagonal checks for squareness etc. before offering girders for final inspection.

I. RDSO Inspection Charges – If BBJ pays any RDSO Inspection Charges for the work. The same amount will be deducted from Contractor's Running Bill.

J. Trial Assembly: for open web girder.
First span is always trial assembled to check whether fabrication process is proper or require any correction in jigs, workmanship or procedures to ensure regular quality output. Following important parameters are checked during trial assembly:-

(1) Camber:
Camber shall be checked while the girder is supported on the nodal points on camber jacks and after releasing jacks i.e. for residual camber with girder resting on bearing ends. The camber measurements should be done with appropriate leveling instrument:

(2) Dimensional check:
i) Overall length
ii) Bearing centers
iii) Height
iv) Truss center
v) Center to center distance of rail bearers
vi) Center to center distance of panel points
vii) Squareness
viii) Alignment of the girder
ix) Fairing of holes
x) Verticality
xi) Infringement, if any
xii) Butting of compression flange.

(3) Component Inspection of first span-Detailed inspection of dismantled components of trial erected span is carried out to see the integrity of components. There should not be any elongation of holes, tearing of edges or other defects after dismantling of trial assembly.

(4) Component inspection of 2nd span onwards:-Once fabrication process is found satisfactory, then only components of 2nd span and onwards should be fabricated with the approved sets of jigs and fixture, the tested WPSS and WPQR as laid out in steps earlier. Field engineer should do the components inspection and ensure all record are available before giving final inspection call inspecting authority.

Plate girder check.
i) Overall length
ii) Bearing centers
iii) Height
iv) Girder center
v) Squareness
vi) Fairing of holes
vii) Verticality
viii) Infringement, if any
ix) Butting of compression flange.

K. Anti Corrosive Treatment- Surface preparation, metalizing and or painting as per applicable painting schedule. Should be done as per provision given in para 39 of IRS:B1- 2001. It should be ensured that paint are procured only through RDSO approved sources. The list of approved vendors by M&C Directorate of RDSO is available on website.

L. Some important Dos & DON'T S is given here for guidance:

-DOs-

☐ Use proper fixtures and clamps to hold them embers firmly at desired location while welding. The clamps and fixtures must be strong enough to prevent any distortion of the member while cooling of

the welding joint. The clamps and fixtures are only to be removed when the joint is cooled to ambient temperature.

☐ Do the welding work in a warm and dry places so that rain water or other atmospheric elements may not come in contact while welding is in progress.

☐ While welding in very cold weather pre-heat the material before welding and apply post heating to prevent the weld joint from rapid cooling and develop stress raiser due to sudden contraction.

☐ Cross level of bearing plates in the welded plate girders should be checked properly for proper sitting over bed plate.

☐ To co-relate use of steel and welders in different members proper records should be maintained.

☐ Drilling of holes through approved set of jig particularly long members should be ensured. No fabrication should be done with unapproved jig.

☐ Drain hole in the portal girders at proper locations should be ensured.

☐ Fairing of holes and removal of drill burrs through initial assembly should be ensured.

☐ Proper edge finishing with grinding/special attention in top chord compression members butting by end milling should be carried out

☐ At site during the erection of girders particularly open web girders due and adequate care should be taken to achieve the required camber values.

☐ Camber Jacks should be provided at all the nodal points during trial assembly.

☐ Butting of compression members, X-levels of stringers and alignment of stringers to be checked properly in the trial erection.

☐ Application of paint on permanent contact surface should be ensured after proper surface preparation visual inspection is very important tool.

☐ The plates should be perfectly horizontal while drilling the holes to ensure horizontal verticality of holes.

☐ Steel with proper test certificate/ reports should be used. Commercially available steel in the market should not be used.

☐ Steel received from the rolling mills has generally punch heat mark numbers. These numbers should be legibly marked again with paint for easy identification. Heat mark numbers should be transferred to cut members with paints.

☐ Members of the open web girders should be fabricated on the camber length with the adoption of the field holes of nominal length.

☐ Consistency of weld quality is higher in Submerged Arc Welding Process and chances of human errors are also eliminated. Therefore, welding of the girders should be done by SAW process. Whenever not possible then only CO2 welding or MMAW may be adopted if provided in app. WPSS.

☐ Stage inspection during fabrication should be properly ensured to avoid rejection at later stage.

☐ Skilled and qualified welders, drillers, fitter should be deployed for welding drilling and marking

works. The welder should be individually approved by authorized agency i.e. M&C Directorate of RDSO.

☐ Selection of Angles in fabrication of cross girders and stringers of open web girders requires special attention, drooping in angles either acute or obtuse should not be permitted. It will cause improper sitting of sleepers on the stringers.

DON'T's-

☐ Use of pitted/corroded material should not be done because it gives rise to concentration of stresses and results in poor fatigue strength.

☐ Tack welds in fabrication of riveted open web girders should be avoided.

☐ Do not hammer the distorted joints for rectification. It may lead to the development of cracks and failure of the joints.

☐ Do not do the welding in chilled weather, as due to sudden cooling of welded joints they are liable to be brittle and develop cracks. The joints may also suddenly fail under dynamic loading without any prior warning.

☐ Do not weld with un-controlled welding parameters, these will affect the quality of welding and make the joints weak and may yield in dynamic loading on the structure.

☐ Do not weld the joint haphazardly without following the proper welding sequence. This will lead to uncontrolled and irreparable distortion, of the proper geometry of the joint.

☐ Sharp notches in the member should be avoided.

ADDITIONAL SPECIAL CONDITIONS FOR SAFETY, LAUNCHING AND DELAUNCING SAFETY RULES

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground or from solid construction except for such short period work as can be done safely from ladders. When a ladder is used an extra labour shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable foot holds and hand-holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1(1/4 horizontal to one vertical).

2. Scaffolding or staging more than 3.5 meters above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached bolted, braced and otherwise secured at least 1 meter high above the floor or platform or staging and extending along the entire length thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3. Working platform gang ways and stairways should be so constructed that they should not sag unduly or unequally, and where the height of the platform or the gangway or the stairway is more than 3.5 meters above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in the para above.

4. Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 10 meters in length while the width between side rails in swung ladder shall in no case be less than 300mm forladdersuptoandincluding3.5metresinlength.Forlonger ladders this width should be increased by at

least 20 mm for each additional metre of length. Uniform steps spacing shall not exceed 300 mm. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause anger or in convenience to any persons or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of the defense of every suit, action or other proceeding at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any suits, action or proceedings to any such persons or which may with the consent of the contractor be paid to compromise any claim by any such persons.

5. **Demolition:** Before any demolition is commenced and also during the process of the work:
a) All roads and open areas adjacent to the work site shall either be closed or suitably protected;
b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged;
c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding;
d) No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

6. All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use, and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.
In addition,
a) Workers employed on mixing asphaltic materials, cement and lime mortar shall be provided with protective goggle.
b) Workers engaged in white-washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles;
c) Workers engaged in welding works shall be provided with protective goggles;
d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

Additional condition for safety at worksite:-
(i) The contractor shall not start any work without the presence of BBJ / Railway supervisor or his representative and contractors supervisor at site.
(ii) The Engineer in-charge shall approve the methodology proposed to be adopted by the contractor, with a view to ensure safety of trains, passengers and workers and he shall also ensure that the methods and arrangements are actually available at site before start of the work and the contractor's supervisors and the workers have clearly understood the safety aspects and requirements to be adopted /followed while executing the work.

There shall be an assurance register kept at each site. Which will have to be signed by both, i.e. BBJ's representative as well as the contractor's supervisor as a token of their having assurance for safety.

Safety at worksite –
Before permitting the execution of certain works like earth work, supply of ballast for new or existing rail line, gauge conversation or laying of concrete sleepers and rails etc. where it is necessary to used road vehicle/machinery, BBJ representative and Open lines Engineering – incharge(ADEN(Br)/ Sr.DEN(Br) of Railway of the section shall ensure that he receives the prior intimation/ Confirmation of the following aspects from Officer in charge of the work of the executing agency i.e. construction, electrification, S&T etc.

Name & address of the contractor assigned to execute the work.
Contractor's list of the number(s) of individual vehicle(s) names and license particulars of the

driver(s) proposed to be used. Information regarding location, during & timings during which the vehicles are planned to be applied.

Training to supervisor /staff of contractor. Competency certificate to be issued by BBJ / Railway's Engineer in charge of site.

Survey of site by supervisor of contractor, BBJ & Railway's supervisor to assess the precautions to be taken at site for working of trains and material required for protection.
Draw and advice to sectional ADEN/SSE(Bridge) of Railway about the detailed planning of work including protection of track and safety measures proposed to be adopted.

BBJ & Railway representative should know the names of supervisors of construction organization/other organizations who are going to be in charge/ In-charge of worksite.

Before the start of work, the land strip adjacent to running track where road vehicle/machinery is to ply for the work shall be demarcated by line in advance at the appropriate distance from the center of existing track in consultation with BBJ & Railway supervisor.

Barricading to be provided as per instruction and design given by of BBJ / railway representative in full length at work area along the track at specified distances.

The work site shall be suitably demarcated to keep public and passengers away from work area. Necessary signage boards such as 'Work in progress 'etc shall be provided an appropriate locations to warn the public/passengers.

Contractor should ensure that all the requisite measure has been taken before start of the work.

Measures to be ensured during the execution of the work -Contractor have to depute trained supervisors at work sites duly certified by BBJ/ Railway's In charge of the work.

Drivers of vehicle have been briefed about the safety and precautions to be taken which moving/working close to traffic.

The contractor shall not allow any road vehicle belonging to him or his suppliers etc. ply within 6meters of center of running line without presence of BBJ / Railway supervisor.

Contractor shall ply road vehicles Only between Sunrise and Sunset. In case of emergency where it is necessary to work during night hours, sufficient lighting shall be ensure in the complete work area for the safety of public and passengers. Also additional staff shall be posted as necessary for night working.

Wherever provided the engineering indicator boards shall be lit during night hours as per the provisions of P. Way manual. Contractor shall ensure that road vehicle/machinery ply in a way so that these do not infringe the line of demarcation.

Look Out man shall be posted where necessary.

In unusual circumstances, where operator apprehends infringement to track while working truck/machinery near running track, following action shall be taken.

a) The contractor/supervisor/vehicle operator immediately advises the situation to BBJ / Railway official and assists him in protecting the track.

b) Protection shall be done as done for other emergencies. Individual vehicle/machinery shall not be left unattended at site of work. If it is unavoidable and becomes necessary to stable the road vehicle/

machinery at plant near running track, these shall be properly secured against any possible roll- off and always be manned even during non-working hours.

All temporary/ arrangement required to be made during execution of work shall be made in such a manner that moving dimension do not infringe. Necessary checks shall be exercised by site in charge from time to time.

In case, work has been planned to be done within 6 M of center of track but at more than 3.5 M it shall be ensured that. Necessary precautions for protection of track have been taken and caution order issued to trains.

Look out man has been posted along the track at a distance of 800 M from the location of work with red flag and whistle to warn the road vehicles regarding approaching trains.
In case, work is planned to be done within 3.5M of centre line of running track, it shall be ensured that the work is done under block protection only and necessary safety precautions for protection as per Para No.810 and 819 of IRPWM are taken.

While digging in station area, if any cable is found, digging should be stopped and concerned signaling/electrical staff should be informed immediately.

Mobile phones or walkie-talkie sets where necessary should be provided at works sites.
While inspecting the work site standard check list shall be used to ensure that all the requisite measures have been taken during the execution of the work.

Precaution required to be taken during execution of work requiring traffic blocks.

Any work, when infringes the moving dimensions, shall be started only after the traffic block has been imposed and track protected At locations where night working is unavoidable, proper lighting arrangement should be made.

Before closing the work the track shall be left with the proper track geometry so that the trains run safety.

After completion of work, the released sleepers and fittings should be properly stacked from the track to be kept clear of moving dimensions. Block shall be removed only when all the temporary arrangement machineries, tools, plant etc have been kept clear of moving dimensions.

Stacking of material along Railway track - The sites for material stacking shall be selected in advance ensuring that no part of the stacked material would infringe the standard Moving dimensions. A plan of proposed stacking locations be made and signed jointly by an authorized BBJ / Railway's representative and contractor's representative.
The selected location shall be marked by lime in advance.

Presence of an authorized BBJ / Railways representative unloading and stacking shall be ensured.

The material shall be stacked such a height, which will not cause infringement to SOD in case of accidental roll off.

Safety aspects to be observed while working in OHE area. No electrical work close to running track shall be carried out without permission of BBJ / Railway representative.

A minimum distance of 2m has to be maintained between live OHE wire and body part of worker or tool of metallic support etc.

No electric connection etc. can be tapped from OHE. Authorized OHE staff from Railway should

invariably be present when the relaying work or any major work is carried out,
Power block is correctly taken and 'Permit to work' is issued.

The structure bonds, track bonds cross bonds, longitudinal rail bonds are not disturbed and if disconnected for the work they are reconnected properly when the work is completed.

The track level is not raised beyond the permissible limit during the work.

Note: For items of barricading, Sign Board like "work in progress" walkie - Talkie sets, mobile phones, look out man etc, suitable provision may be incorporated as per site requirement.

For "Safe working of Contractors" Para 819 of IRPWM June 2020 shall be applicable A large number of men and machinery are deployed by the contractors for track renewals, gauge conversions, doublings, bridge re girdering, rebuilding etc. It is therefore essential that adequate safety measures be taken for safety of the trains as well as the work force. The following measures should invariably be adopted:-

i) The contractor shall not start any work without the presence of BBJ / Railway supervisor at site.

ii) Wherever the road vehicle and/or machinery are required to work in the close vicinity of railway line, the work shall be so carried out that there no infringement to the Railway's schedule of dimensions. For this purpose, the area where road vehicles and or/ machinery are required to ply shall be demarcated and acknowledged by the contractor. Special care shall be taken for turning/reversal of road vehicles/ machinery without infringing the running track. Barricading shall be provided wherever justified and feasible as pet site condition.

(i) The look out and whistle caution orders shall be issued to the trains and speed restrictions imposed where considered necessary. Suitable flag men/detonators shall be provided where necessary for protection of trains.

(ii) The supervisors/ workmen should be counseled about safety measures. A competency certificate to the contractor's supervisor as Performa annexed shall be issued by BBJ / Railway, which will be valid only for the work for which it has been issued.

(iii) The unloaded ballast/rails/sleepers/other P.way materials after unloading along the track should be kept clear off moving dimension and stacked as per the specified heights and distance from the running track.

Supplementary site specific instruction, wherever considered necessary shall be issued by the Engineer in Charge.

General methodology required to be adopted for re-girdering of Girder:
The tenderer(s) are supposed to develop & submit the complete details of scheme/work programme of their own and same shall be got approved by the BBJ and Railway. The scheme should be developed from the following guidelines.

The Assembling, Erection, Cambering, drifting, HSFG bolting etc. shall be done outside the railway track.

After assembling, the girders are to be launched by side slewing method or any other method (approved by BBJ and Railway) after de-launching of existing old span outside the track in the same traffic block.

Necessary scheme for launching and de-launching along with all temporary staging arrangements required for this work to be got approved from BBJ and Railway or their

authorized Institution and reliability of all equipment, tools & plants to be ensured in field by BBJ and Railway representative.

All safety measures for track protection, protection of OHE and other equipments / cables of S&T/ Power department should also be ensured during pre block/ main block activities. Girders after de-launching to be removed from river bed to clear water way before monsoon.

Agency/ tenderer needs to arrange on their own required nos. of CC Cribs, wooden sleepers, second hand rails, trestles etc. for the work.

Precautions to be observed during erection /assembly /launching of girders.

The work will have to be carried out in such manner so as to cause least obstruction to Railway traffic and also without jeopardizing the safety of moving trains. The successful tenderer shall also take all necessary precaution to ensure the safety of his workman / machinery at the site of construction. The BBJ will not be liable for any payment of compensation due to any mishap to the workman or machinery during the course of work. The work shall be planned in such a way so as not to cause any infringement to the moving dimensions laid down in the "Standard schedule of dimensions for broad gauge of Indian Railways' currently in force.

If there are some changes/ modifications in design, drawing as per site condition to complete the work successfully and contractor has to do the same under accepted rates and no extra claim of rates will be entertained on this account. No work shall be allowed at work site without presence of BBJ / Railway representative.

The contractor shall maintain sufficient accuracy in the assembling and erection of every part of the work to ensure that all parts fit accurately together on erection.

The contractor shall maintain a master steel tape of approved make for which he has to obtain a certificate of accuracy from the Normal Test House calibrated under a tension of 1.8 Kg at 16.70 degree centigrade.

SPECIAL CONDITIONS FOR LAUNCHING OF GIRDERS;-
Straightening and repairing minor damage of girder parts in transit and handling including petty repairs to fabricated materials.

All the permanent field connections for all the girders or some of the girders as per BBJ / Railways requirements and approved drawing & design to be done by riveting or by HSFG bolts of suitable size and necessary arrangements for using HSFG bolts of approved brand to be done by contractor.

The rates of this item also includes supplying and fixing of HSFG bolts of required size and barrel length along with nuts and DTI/ Plain washers as per detailed scope of work required for assembling of girders at site.

Preparation of ground/ bed, providing & erecting temporary crib /trestle supports, platform and staging for assembling of new girders.

Use of Railway land required by the contractor(s) for assembling of girder etc. will be permitted to him/them free by BBJ, if available. The contractor will have to make his own arrangement for use of private land, outside Railway limit for due fulfillment of contract, directly with the land owners or local authority and to pay such rents if any as mutually agreed upon between them.

The contractor shall submit his detailed **launching scheme** for assembling erecting and launching of girder within the guidelines given in scope and details of work and get it approved from BBJ and Railway.

The work shall be done in conformity with the approved drawings. The rate shall include all temporary arrangements like preparation of river bed for assembly and erection/launching, staging, trestles, all T&P and machineries/cranes, labour, consumables etc. complete required for assembly and launching of girders, lowering and fixing properly on the bearings, including grouting of holes of anchor bolts with epoxy material and other works required for successful completion of erection and launching as per scheme approved by Railway. The rates include supply of HD bolts, drilling of abutment / pier and fixing of bolts.

The entire work of launching and de launching is to be done in same traffic and power block. Full Traffic and power block will be arranged on contractor's request and will be granted as convenience by Railway.

Any defects noticed during the execution of the work shall be rectified or replaced by the contractor at his own cost till the satisfaction of the engineer in charge. The decision of the BBJ / Railway or its inspection agency as to the existence of the defect manner in which the defective work has to be rectified or replaced shall be final and conclusive.

The BBJ reserves the right to reject the whole or part of the work executed which in the judgment of the BBJ, does not comply with the requirements of the specifications. The decision of the BBJ shall be final and conclusive for all purposes. The contractor shall make his own arrangements to procure all the equipment required for successful launching of girders like cranes, gantry, derricks, winches, tackles, pulleys, jacks, wire ropes, generators, compressors, tools and plant and machinery etc.

Contractor should read carefully the above special conditions before quoting the rates.

CONDITIONS (FOR METALISING)

1 All tools and plants, materials required for these work including compressed air, Oxygen and Acetylene gas and other accessories etc. shall be arranged by the contractor.

2 All works are to be done following the special conditions for metalising of Girder bridges attached herewith.

3 **Paints manufactured by the following Firms of repute only shall be used:-**

(1) Asian Paints,
(ii) Johnson & Nicholson,
(iii) Goodlac Nerolac,
(iv) Shalimar Paints,
(v) Berger Paints formerly M/S British Paints
(vi) Garware Paints,
Paints for both the primer and finishing coats may be preferably be procured from the same firm for achieving better result.

4 Random representative samples shall be got tested at the Contractor's expense at any Test House which is found convenient by the BBJ. If the test results do not conform the relevant IS Specifications, the whole lot / lots of paints shall be rejected and got removed from the site by the Contractor. Paints from rejected lot, if already applied shall be removed and the girders repainted by the Contractor at his own cost.

5 The empty drums of paints used in this work will be the contractor's property and will be kept in BBJ's custody till the completion of each span in case of important bridge and of each bridge in case of major and minor bridge. After completion of each span in case of important bridge and in case of each major and minor bridge, the empty drums will be returned to the contractor.

6 It is obligatory on the part of the contractor to undertake the metallising of the steel area under sleeper seats. The labour required for shifting the sleepers under the direction of BBJ / Railway's Inspectors will have to be supplied by the contractor at his own cost. The tools needed for shifting of sleepers are also to be arranged by the contractor. Necessary block for the work will be permitted by the BBJ after receiving the same from Railway, if necessary.

7 Thickness of sprayed Aluminium layer and paint layer should be strictly followed as mentioned below:-

(a) Metalising 150microns (Dry film thickness).

(b) One coat of etch primer (IS: 5666)

(c) 2ndcoat primer zinc chromate IS:104. 20microns (Dry film thickness).

(d) 1stfinishing coat of Aluminium IS:2339 15microns (Dry film thickness).

(e) 2ndfinishing coat of Aluminium IS:2339 15microns (Dry film thickness).

Total: 200 microns (Dry film thickness).

8 Contractor/s have to write maintenance dates as per direction of the site in charge with 25mm long letter/figures by yellow paint on allocation with suitable dimension black background on his own cost.

9 Additional special conditions (for metallising).

a) The surface preparation shall include removal of all traces of rust by sand/grit blasting and exposing of the parent metal as per the direction of the BBJ / Railway Engineer and work of metallising shall be started only after the surface preparation is upto this satisfaction of the BBJ / Railway Engineer.

b) Entire exposed surface shall be washed with clean and plain water so as to wash away all the soluble iron salts from the exposed surface. Metallic spray shall be applied only after the washed surface is fully dried up. To expedite the drying process blow drying may be resorted to.

c) At least one layer of metallic spray covering the entire exposed surface must be applied within four hours of surface preparation and spraying of multiple layers in complete metallizing of the surface ,upto a minimum thickness of 150 microns mm, must be completed within 8(eight) hours of surface preparation.

d) The specified thickness of coating shall be achieved by spraying in multiple layers. The surface after spraying shall be free of lumps of loosely adherent sprayed metal.

e) Clean, dry air shall be used for spraying the metal with not less than 4.218kg./ sq.cm. air pressure at the air control unit.

f) The length of the hose pipe between air control unit and the gun shall not be more than 10.5 m and the internal dia of the hose shall not be more than 9.5 mm.

g) Metallising shall be carried out as per the specifications confirming to IS 6586 and as per the instructions laid in Appendix VII of the IRS/ B-I of 2001.

h) The diameter of the aluminium wire used for spraying shall be within 3mm to 5mm.

i) Within 4 hrs. of completion of metalising one coat of wash primer conforming to IS- 5666 shall be applied.

j) When wash primer is dried, one coat of paint zinc chromate primer conforming to IS 104 shall be

applied over it as per the direction of the site Engineer. The zinc chrome should conform to type 2 of IS: 51

k) On drying of the above coat, one coat of paint aluminium conforming to IS 2339 is to be laid as a first covering coat as per the direction of the BBJ / Railway Engineer.

l) 2nd. covering coat of paint aluminium conforming to IS 2339 shall be applied on drying of the first covering coat as per the direction of the BBJ / Railway Engineer.

m) Cost of all types of destructive and non destructive tests, which will be considered necessary by the site Engineer for quality control, shall be borne by the Contractor.

n) In case of any faulty work the site Engineer shall reserve the right to reject the same and direct the contractor to again do the work after preparing the surface afresh without any extra payment.

Special conditions for metallising

1 Specification for surface preparation and metallising will be detailed in IRS BI/2001 and the rate for metallising is inclusive of all works as per these specifications.

1.1 The metalising shall be carried out with aluminium metal as per the specifications. The surface. After preparation shall be got approved by the BBJ's Engineer-in-charge before the work of metallising is commenced. All the labour, materials and equipments for metallising, including surface preparation and the measuring equipment required for carrying out inspections as per the specifications shall be provided by the contractor at his own expense. The rates quoted shall, therefore, be all inclusive.

1.2 The work will be inspected by the BBJ / Railway's Engineer or their representative from time to time, for which necessary facilities shall be offered by the contractor. All the equipments for inspection and measurement as contained in these specifications shall be provided by the contractor at his own expense and no additional payment will be made for the above. Based on the results of his inspection, the inspecting officer will issue the necessary inspection certificates in acceptance of the work for each completed span as may be decided by him.

Payment will be made to the contractor on bills submitted duly supported by inspection certificates. The opinion of the Engineer as to whatever the work has been completed satisfactorily or not, shall be final and binding on the contractor. In the event of any defect in the metallising work the contractor shall arrange to carry out such rectification measure as required by the Engineer, and for this no extra payment will be made.

1.3 For the purpose of payment for metallising and painting, the area will be calculated based on the surface areas of the finished, actual work, without allowing any extra for the rivet heads and without making any deductions for any holes.

2 The Conditions of contract under which the contract is to be performed by the contractor shall include the following:-

i) The S.E. Rly Engineering Department's General Conditions of Contract & standard specifications on which the schedule of rates is based - 2001, Vol 2 together with upto date correction slips and also the Regulations for Tenders and contracts and Standard form of Contract therein.

ii) Condition and special conditions of contract. In case of any inconsistency (ii) will prevail over (i).

3 No pass or concessional facilities will be issued to the contractor for his travel or for travel of his Agents or his labour for transportation of materials to be supplied by him.

4 The rates quoted should be inclusive of Sales Tax or any other Tax as may be required to be paid by the Contractor. This will not be paid separately.

5 No interest will be allowed for the money deposited or for any amount payable to the contractor under this contract even if there is delay in making the payment for any reason whatsoever.

APPENDIX VII of *IRSS B1-2001.*

METHOD FOR THE DETERMINATION OF LOCAL THICKNESS MEASUREMENT
Any magnetic or electro-magnetic thickness meter that will measure local thickness of known standard with an accuracy of +/- 10 percent.

CALIBRATION OF INSTRUMENT
Calibrate and check the meter on one of the following Standards (as appropriate).
i (Applicable to magnetic and electro-magnetic meters other than the pull -off type).
A soft brass shim, free from burrs, in contract with the grit-blasted surface of the base metal prior to its being sprayed. The thickness or the shim shall be measured by micro meter and shall be approximately the same as the thickness of the coating.

ii A sprayed metal coating of uniform known thickness approximately the same as the thickness of the sprayed coating to be tested, applied to a base of similar composition and thickness to the article being sprayed, grit-blasted in accordance with Clause-1.

PROCEDURE.
For each measurement of local thickness, make as appropriate number of determination, according to the type of instrument used.

With instrument measuring the average thickness over an area of not less than 0.645 cm. The local thickness shall be the result of the one reading. With instruments having two such probes , each reading shall be the average of two determinations with the probes reversed in position.

METHOD OF TEST FOR ADHESION
Using a straight - edge and hardened steel scriber which has been ground to a chart 30 degree point, scribe two parallel lines at a distance apart equal to approximately 10 times the average coating thickness. Inscribing the two lines, apply enough pressure on each occasion to cut through the coating bases metal in a single stroke.

SURFACE PREPARATION:-
The surface shall be thoroughly cleaned and roughened by compressed air blasting with a suitable abrasive materials in abrasive material in accordance with Clause of IS ; 6586. Immediately before spraying it shall be free from grease, scale, rust, moisture or other foreign matter. It shall be comparable in roughness with a reference surface produced in accordance with Appendix A of IS: 5909 and shall provide an adequate key for the subsequently sprayed metal coating.

3 POWER BLOCK
To execute the work near OHE portion power block will be required which will be arranged by the BBJ / Railway. The power block will be allowed in short time either in day or night time. No extra payment can be claimed due to non availability of power block/ Traffic block for contractor's idle labour.

3.1 Cost of lighting arrangement if any shall be borne by the contractors.

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Special instruction for metalizing work of bridge girders & channel sleepers.

3.1 BBJ/ Railway Representative will ensure the issue of suitable caution order for the safe and uninterrupted movement of traffic before the work is under taken on any bridge and till this is issued the work shall not be commenced. In electrified sections, painting on the members of through and semi- through girder bridge coming in the zone of influence of electricity shall have to be done during power blocks to be arranged. The BBJ/ Railway Representative shall be fully responsible for ensuring the uninterrupted movement of Railway traffic except when painting is done under power block. The Contractor should engage sufficient number of lookout men to warn the workmen of approaching trains.

3.2 The work should be supplied with protective equipments such as goggles, facemask, gloves, overalls etc.

3.3 Scaffolding and staging should be sufficiently strong to take the load of the materials and men required to execute and inspect the works.

3.4 Heavy materials such as rails, scaffolding hooks, etc. may not be taken on the bridge without adequate protection by Contractor, as per the General and Subsidiary Rules.

3.5 Scaffolding, staging etc. shall not infringe the prescribed schedule of dimensions.

3.6 On bridges where there is a risk of persons failing and drowning, necessary equipments such as life-buoys etc. should be kept ready by the Contractor.

3.7 A fully equipped first aid shall be maintained at the site by the Contractor with a person fully trained to give First Aid .

3.8 Inflammable articles e.g. petrol, oil etc. should be stored separately from other materials and all prescribed precautions as per the Indian Explosives Act shall be taken by the Contractor.

3.9 Staging and scaffolding should be provided for at least to full spans and should not be removed until the final coat of paint is applied, inspected and found satisfactory.

3.10 Random representative samples shall be taken as prescribed in section 3 of IS:101 from each lot of paint supplied and shall be got tested any at Test House, as found convenient.

3.11 In addition to the tests conducted as per special condition No. 3.10, the BBJ shall conduct the following field tests at site before using the paint (a minimum of two test per batch of paint shall be conducted at Random) ;-

i) Weight per litre cup 100ml. Capacity stainless steel,
ii) Consistency test by Ford Cup Viscometer No.4,
iii) Scratch hardness test (hand operated),
iv) Flexibility and adhesion test with 6.25 mm rod.

This is to ensure that the quality of the paint is properly maintained right upto the stage of usage.

3.12 Field-cum site order books shall invariably be maintained by Contractor bridge wise. These should be offered to the inspecting officers for their perusal and remarks.

3.12.1 The field-cum-site order book shall contain the following information:-

i) Section, Km, Bridge No, Span details, Type of girder (indicating CE'sDrg.No.).

ii) Details of paint received lot wise, I.e., name of Manufacturer, date of manufacture, date of expiry, Batch No. ,Referrence to specifications, Referrence to Test Certificate of Test House.

iii) Dates of commencement and satisfactory completion
a) Surface preparation;
b) Metalising;
c) One coat of wash primer;
d) Painting of zinc chrome primer;
e) Painting of first finish coat of aluminium;
f) Painting of second finish coat of aluminium;

iv) Measurement of thickness of paint as measured and test checked by BBJ / Railway for each coat of painting.

v) Results of the test conducted by the BBJ / Railway in the field on the paint, as per special condition No 3.11.

vi) Record of consumption paint vis-a vis actual area covered span wise.

vii) Labour strength employed by the Contractor;

Viii) Any other important and special instructions given to the Contractor by the Inspecting Officers of BBJ / Railway;

ix) Details of checks conducted in the paint godown/shade of the contractor.

4 Each entry in the field-cum-site order book shall be signed by the BBJ / Railway's Engineer's representative and the contractor. (or his authorized representative).

5 Each contract certificates will be accompanied by a certificate by the BBJ / Railway as under :-

"Certified that the surface preparation, primer coats/ finishing coats of span No…….. Of bridge ……..up/down/mid have been satisfactorily completed as per specifications ."
Measurement: Actual area scraped / painted shall be recorded. Only the project area shall be measured and no extra will be allowed for scrapping / painting rivet/ bolt heads and nuts .

The contractor shall maintain the painted bridge (s) for **15 (Fifteen)** calendar months after completion of the entire work as per agreement. He will also guarantee the finished work to be free from all the defects of the specifications for the maintenance period. Rectification, if any, during the period, will be done by the contractor at his cost. The decision of the BBJ in this regard to the need for rectification shall be final and binding on the contractor.

NOTES FOR"H"BEAM SLEEPERS

1. The work is of trial nature and may need modification during fabrication to suit RDSO requirement.

2. The tenderer should procure fittings from RDSO approved vendors. The indented fittings should be offered for RDSO's inspection by the RDSO approved firm directly to RDSO with intimation to firm and Railway only after inspection and passing of fittings by RDSO, the fittings should be supplied by the approved vendors to the tenderer/firm for fixing on H-Beam Sleepers.

3. To ensure this procedure, the tenderer should execute a legal under taking with the RDSO approved different firms for all items involved in fittings of H-Beam Sleepers.

4. (i) The length of sleepers may vary (+)/(-) 100 mm as per site conditions. The contractor also required to fabricate the H-Beam sleepers with minor modification for providing fixing arrangements

of hook bolts altering width from 230mm to 250mm etc. For which he shall be responsible for taking required measurements at the site with his site engineer and getting it approved from Railway's Engineer-in charge for fabrication purpose. The rate quoted herein item wise for all the items of this tender schedule shall accommodate all such miscellaneous works if any.

ii. The rates are inclusive of cleaning of rust etc. at the sleeper and girder contact area and painting with one coat of Epoxy paint to take a thickness of 110 microns dry film thickness. If required the contractor will have to undertake pre-block arrangements for shifting existing channel sleepers for doing painting work. The rate is inclusive of all these works.

iii. Any defects in alignment and X-Level of girder is to be rectified by the contractor's at the time of fixing sleepers in presence of Railway's supervisors/site –in-charge.

5. The rate is inclusive of trial assembling and fixing minimum 10 sleepers (Selected at random) on a nominated bridge. The large scale manufacturing is to be taken up only when satisfactory performance will be obtained on trial.

Payment Schedule:- H Beam Sleepers and its complete fittings and fixtures
(a) On arrival of H-Beam sleepers with all matching fittings components for the number of sleepers received at Bridge work site and fixing at appropriate position in new girder with rail and all fittings**- 80% (Eighty Percent)** duly passed by inspecting officials and supported by relevant test/inspection certificate.

(b) Dismantling of existing steel channel sleepers on released girders , transportation and stacking of the released materials (Small fittings, bridge timbers, steel channel sleepers, worn-out rail etc.) to be nearest store depot of PWI/BRI as directed by BBJ / Railway -**20%(Twenty Percent)**

6. Fixing of all elastomeric pads must be done by Epoxy adhesive as approved by BBJ / Railway supplied by contractor at his cost.

7. For all the supplied items the contractor has to give one indemnity Bond and has to keep the items in safe custody by deputing day and night watchman up to the completion of the work. BBJ will have no responsibility on this account for theft damage loss etc, payment will be entertained accounting the materials fitted and fixed on the running lines. For the materials paid for as per 5(a) but not fixed on a bridge, pro rate recovery will be made.

8. Provision for fixing hook bolts to H- Beam sleepers will be made in the workshop along with the fabrication of the H-Beam sleepers after verifying the site conditions.

SPECIAL CONDITIONS FOR SUPPLY OF CEMENT & REINFORCEMENT STEEL

1.0 Cement and Reinforcement steel for the entire work shall be supplied by the Contractor under relevant Schedule of this tender conforming to IS specifications and Indian Railways Unified Standard Specifications- 2019.

1.1 Cement
1.1.1 Cement to be used in this work shall be conforming to IS 12269 for 53 Grade Ordinary Portland Cement and IS : 1489 for Portland Pozzolana cement.

1.1.2 Cement produced by reputed manufacturer approved by the Engineer – In – Charge shall be supplied by the Contractor and used for construction.

1.1.3 Decision of Engineer regarding reputed firms shall be final and binding on the contractor.

1.1.4 Cement within 3(Three) months from the date of manufacture shall only be used in the work covered under various schedules of the agreement.

1.1.5 Cost of the cement procured by the contractor should be paid only after consumption towards the different item of works of schedules.

1.2 Steel
1.2.1 Steel produced by following manufacturers only shall be supplied by the Contractor and used for construction.
a. SAIL

b. TISCO

c. RINL

d. and any other approved Vendors works/plant Registered with RDSO as Primary Steel Producers having Integrated Steel Plant (ISP) and using iron ore as the basic raw-material and having in-house iron rolling facilities, followed by production of steel through the process of DRI-EAF, BF-BOF and Corex - BOF only. On the date of purchase firm should have been in approved list of RDSO.

1.2.2 Reinforcement steel bars used for work shall be High strength deformed bars of Grade Fe500 D TMT/Rebars conforming to specification IS:1786.

1.2.3 In addition to the above, as per Railway Board's Letter No. 2018/06/CE-III/BR/Stainless Steel dtd.02.05.2018 Stainless Steel Reinforcement bars (Grade G (410L)-Ferrite conforming to IS 16651:2017) to be used for the following structures:
(i) Bridges in coastal area (up to 30 kms. from coast): Railway bridges, FOB, ROB/RUB, Rail Flyover/Metro, Mono Rail crossings.

(ii) Tunnels in coastal areas.

(iii) C&W and Loco inspection pits, catwalks, washing aprons & water tanks at all places.

(iv) Any other structure located in extremely adverse environmental conditions or where frequent inspection is not possible even if it is away from coastal area after due justification & with the personal approval of BBJ.

1.3 General
1.3.1 The contractor has to arrange the manufactures test certificate for the steel and cement procured at the site along with the other documents such as invoices etc.

The Contractor shall arrange testing of cement and steel as directed by BBJ/ Railway representative. All the charges for testing of all materials shall be borne by the contractor. Steel shall be tested for tensile strength, elongation, bend test etc. Testing of these materials shall be done at approved laboratories/recognized laboratories as is being done by other Government Organizations such as CPWD.

1.3.2 Steel and Cement used for work will be paid as per relevant items in Schedule of quantities and rates. The rate for supply of steel also include costs of transporting, loading, unloading, handling, re-handling, cutting , bending with all lead, lift, and all taxes and incidental charges etc. The rate for supply of Cement is also inclusive of transportation, loading, un loading, re-handling, storing with all lead, lift, all taxes and incidental charges etc.

1.3.3 BBJ / Railway reserves the right to inspect contractor's Godowns and documents pertaining to this work.

1.3.4 The contractor shall use these materials in the work as per specifications contained in this document approved drawings and shall not use less quantities than what is stipulated in the relevant specifications/approved drawings.

1.3.5 No allowance wastage on any of the materials supplied by the contractor including Cement and Steel is payable by the BBJ.

1.3.6 Contractor will make his own arrangements for storing cement, steel and other materials.

1.3.7 Reinforcement steel should be paid only after utilization in RCC work. Payment should not be made for bars projected beyond the casting level until the same is concreted in next stage.

1.3.8 Standard weights as per relevant IS code will be followed for arranging payment for steel.

1.3.9 The contractor should disclose the sources from where supply of steel & cement received by him and shall maintain detailed records of receipt of steel & cement from different locations and shall keep the challans, R.R. No, Lorry No etc and shall enter the receipts, issues and balance in the register and produce the same to the BBj / Railway's Engineer in charge or his representative as demanded.

SCHEDULEWISE/ITEM WISE INSTRUCTIONS / NOTES

Additional Special and payment conditions

For item no.1 & 2 of schedule-A.

1. All the launching and de-launching works of Re-girdering works have to be under taken in the allotted traffic and power blocks though it is mentioned as "Not requiring traffic block" in the description of the item. The entire launching has to be done within specified line/ power block. No extra payment will be made over the accepted rates for working in traffic block.

2. De-launching of the existing girders and launching of new bridge girders including dismantling of CC cribs /wooden cribs to be carried by using Road crane of sufficient capacity and sufficient numbers. One additional Crane of same capacity is to be kept as standby in addition to the number of cranes used in the operation of Re-girdering works.

3. If the girders launching is done by using BBJ's crane, necessary charges will be deducted from the contractor's bill at the rate fixed by the BBJ.

4. For Item no.4 of Sch-E- H-beam sleepers- If the bridge is in curve, The H-beam sleepers need to be prepared as per the site requirements without claiming extra rate over the accepted rates.

5. Necessary Hire charges for using Railway's CC cribs or any materials will be deducted from the contractor's bill.

6. All the Scrap and released materials to be returned to the Railways as per instruction given by the BBJ / Railways Engineer in-Charge or his Authorized representative at Railways' nominated/ designated places after completion of the work.

7. The Schedule of Quantity is only approximate and may vary as per site condition. Any items of USSOR-2021 may be added or deleted as directed by the BBJ / Railways Engineer in-Charge to complete the work in all respect.

8. The Fabrication and supply of CC cribs should be done with structural steel confirming to IS:2062 as specified in the drawings and as per the directions of BBJ / Railways Engineer-in-charge of the work.

9. Riveting/welding shall not be started until such time the BBJ / Railways Engineer has personally

satisfied himself that the alignment of the structure is correct.

10. The CC Cribs should be delivered to the Godown / Courtyard of the respective BRIs of Waltair division, ECOR as per requirement and directions of BBJ / Railway representative.

LOCATION SHEET

Sl. No.	Br. No.	Span in Mtr.	Type of Girder	Drg. No.	Section	Location
1	624 UP	1 x 12.2 + 2 x 18.3	PG	BA-10291 BA -10973	LDX-JMPT	351/43 – 352/5
2	655 UP	3 x 24.4	PG	6909	JMPT-KNRT	362/31 – 363/1
3	784 DN	7 x 18.3	PG	19788	SNM-VBL	402/52-46
4	836 UP	10x 18.3	PG	19788	VBL-DNV	418/13 – 419/1
5	701 UP	9 x 12.2	PG	BA-11277	GMDA-PVP	378/11 -17
6	929 UP	6 x 12.2	PG	400-A	GPI-GRBL	446/1-5
7	1205	5 x 30.5	U/S	BA-6081	BHNS-BCHL	432/25-32
8	890 DN	2 x 12.2	Semi Thr.	BA-1056	DMK-SZY	330/20-21

General Special Conditions

1. CAPACITY AND CAPABILITY: Tenderers fulfill the following condition will be consider for award of this works.

1.1 The tendering firm shall be from RDSO approved list of firms for steel bridge girder, in case the tendering firm is not in the list of RDSO approved firms for Steel Bridge Girder, then he will have to get the steel girder manufactured through an RDSO approved firm in the RDSO approve premises only.

1.2 Place for fabrication of steel girder: The steel girders to be manufactured by the tendering

firm in RDSO approved premises only.

2. Before submitting tender, tenderer will be deemed to have satisfied himself, by actual inspection of the site and locality of the work, that all conditions liable to be encountered during execution of the work are taken into account and that the rates, he enters in this tender document, are adequate and all inclusive to accord with the provisions in clause-37 of the GCC-2022 of Railway for completion of the works to the entire satisfaction of the BBJ/ Railway.

3. RECOVERY OF INCOME TAX & CESS CHARGES:
In terms of section 101 (c) of the Income Tax Act, 1961, Income Tax including surcharge levied there on shall be deducted, without any exception, from all payments made to the contractor by the Railway in discharge of this contract at the rate notified by the Central Government at the time of making such payments and deduction certificates would be issued to the contractor on his request. The contractor is advised to settle his final account with the respective Income Tax Officer.
Labour welfare cess charges will be recovered from contractor @ 1% of each bill.

4. List of plant and machinery: Tenderer has to make his own arrangements for execution of works. The tenderer is required to submit, along with his tender, list of plant and machinery available on hand (own) and proposed to be inducted (own and hired to be given separately).

5. Certificate of Familiarization: The Tenderers should attach certificate of Familiarization for the site of work and the working condition there in all respect with regard to bridges, sleeper renewal, topography of the area, availability of labour, water, electricity, access road to the site of work and availability of construction materials etc.

6. List of Personnel and Organization: Tenderer is required to submit, along with his tender, list of Personnel and Organization available on hand (own) and proposed to be engaged for the subject work. The tender without this information may be treated as if the tenderer has no personnel and organization and that no personnel and organization are proposed to been gaged for the subject work.

7. Change in quantities and items: The BBJ reserves rights to modify any or all items of the schedules including deletion of any of the item. Therefore, tenderer should quote reasonable and workable rate for each of the items. The contractor shall not be entitled for any revision of rates due to such increase/decrease in quantities of items and payment shall be made on the basis of actual quantities executed under various items and at the accepted rates thereof.

8. Fluctuation in market rates: Rates quoted by tenderer and accepted by the BBJ shall hold good till completion of the work and are not subject to fluctuation of any kind except what is admissible under the Price Variation Clause.

9. Rates to include all taxes: Rates quoted by tenderer shall be inclusive of all taxes levied by the central government, state governments, municipal corporations, local bodies or any other authorized bodies and no separate rates for any taxes extra will be paid by the BBJ.

10. MAINTENANCE OF THE WORK: The work shall be maintained for a period of **12 months** from the day of completion of the work.

11. PLYING OF ROAD VEHICLES NEAR RUNNING RAILWAY LINE: The contractor shall not allow any road vehicle belonging to him or to his agents to ply in Railway land next to running Railway line. If for execution of certain works, such as earthwork, supply of ballast etc, it becomes necessary to use road vehicles in Railway land next to the running Railway line, the contractor shall apply to the engineer-in-charge for giving permission for such type of work with individual vehicles number,

names and license particulars of the drivers, locations of works, duration and timings for such movement etc. The engineer-in-charge or his authorized representative will personally counsel, examine and certify all such road vehicles drivers, contractor's flagmen and supervisor, and will give written permission with name of road vehicles, their drivers, contractor's flagmen and supervisors etc to be deployed on the work along with location, period and timing of the work. This permission will be subject to obligatory conditions detailed hereunder in subsequent sub-Para

11.1 The nominated vehicles and their drivers will only be utilized for the work and only in presence of at least one of the flagmen and one of the supervisors certified for such work as above.

11.2 The vehicles shall ply at least 6.0 M clear of track. Any movement or work at less than 6.0 M and up to minimum 3.5 M clear off track centre shall be done only in presence of BBJ / Railway employee authorized by the engineer-in-charge. No part of the road vehicles will be allowed at a distance at less than 3.5 M from track centre.

11.3 The contractor shall remain fully responsible for ensuring safety and, in case of any accident, shall bear cost of all damages to his equipment and men and also all damages to the Railway and its passengers. The Engineer-in-charge may impose any other conditions necessary for a particular work site.

11.4 The road vehicles can ply along the Railway line after suitably cordoning off the Railway line at a minimum distance of 6.0 M from the centre of the nearest Railway line. For plying of the road vehicles during night hours, adequate measures shall be prescribed in writing by the engineer-in-charge along with as ite sketch and the same should be communicated to the contractor, contractor's representative, supervisor-in-charge of the work and of the section.

12. PREVENTION OF ACCIDENTS:

12.1 The contractor shall be responsible for the safety his workmen and shall provide them with necessary standard wear and apparel consistent with the nature of work being executed by his workmen.

12.2 The contractor shall ensure safety of his workmen by posting necessary flagmen, whose job will be to caution the workmen of approaching trains, when his workmen work on or near running Railway line. Similar action would be taken, while working on or near road in use.

12.3 The contractor shall protect the site of the work, excavated areas etc by adequate fencing and or other suitable means to prevent accidents to his own workmen, the Railway men or any member of the public.

12.4 **Should any accident take place, total cost of damage including the cost of treatment, loss and or compensation to all affected person/ organization shall be payable by the contractor. In case the BBJ, under any circumstance or law of the country, pays such damage, the same shall be fully recovered from the contractor's dues.**

12.5 The luminous tape, strung on bamboo poles can be considered for barricading such area, the cost of which is included in the quoted rate, as per the instructions of BBJ / Railways engineer at site.

12.6 The contractor shall provide all necessary fencing and lights to protect the public from accident, and shall be bound to bear the expenses of defense of every suit action or other proceedings at law that may be brought by any persons/organization for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit action or proceedings to any such persons or which may with the consent of the contractor be paid to compromise any claim by any such person.

13. SPECIFICATIONS OF WORK AND MATERIALS:

13.1 **Entire work shall be carried out in accordance with the specifications contained in Railway's GCC-2022 subject to modification, addition, supersession by the special specifications contained in this tender document.**

13.2 Any specifications, not covered by this tender document, shall be in accordance with relevant IRS codes, BIS codes and or IRC codes read in the order as they appear here.

13.3 Materials to be supplied by the contractor for the work shall conform to specifications contained in this tender document. If called upon, the contractor shall state the actual source of supply of materials to be supplied by him and shall submit samples for prior approval. During execution of the work, all materials brought to the site by the contractor must be offered for inspection and passing by the BBJ / Railway's Engineer or his representative before being used in the work and such approval shall be recorded in a register maintained for the purpose.

13.4 All paints to be used shall only be those manufactured by one of the following firms or any other approved brand by the BBJ / Railway's Engineer. These materials shall be brought in sealed drums and deposited to the BBJ/ Railways supervision and each such drum shall be opened in the presence of the BBJ / Railway's Engineer before use

☐ *Jenson Nicholson/Asian paints.*

☐ *British/Berger Paints.*

☐ *Shalimar Paints.*

☐ I.C.I.

13.5 Samples of materials to be supplied by the contractor may be got tested at the contractor's cost in any recognized laboratory at the sole discretion of the BBJ / Railway's Engineer.

14. HIRE CHARGES:

14.1 **In general BBJ will not supply any tools, plants & equipments etc. on hire**. Tenderer has to make his own arrangement. However during emergency, BBJ may give to the contractor any plant and equipment on hire, if available, on a specific request made by the contractor to the BBJ. However, the BBJ shall not entertain any claim of the contractor for compensation due to the BBJ's failure to do so. The BBJ shall also not entertain any excuse of the contractor for slow progress or non-performance of the work due to the BBJ's inability to supply such plants and equipments.

Issue of such plants and equipments shall not be allowed as a matter of routine, rather shall be permitted only in those cases where need for help from the BBJ could be established having regard to the nature and urgency of the situation and without adversely affecting normal requirements of the BBJ. A statement of materials, thus issued, and hire charges recovered should invariably be furnished along with the final bill by the contractor.

14.2 Recovery of hire charges: The hire charges will be recovered from the contractor based on book value or last purchase/ manufacture rate (whichever is higher) of the material, depreciation charges at assumed depreciation rate of 10% for the period engaged, and with 6% interest charges per annum on total cost of material or rate vetted by accounts.

14.3 The contractor shall bear the cost of carriage, including other incidental charges such as loading, unloading, handling etc, of the plants and equipments to the site of the work and also back to the depot from where they were issued.

14.4 Running expenses including fuel, lubricants and stores and labourers, for the plants and equipments supplied by the BBJ, shall also be paid for by the contractor at the cost to be determined by the BBJ.

14.5 Staff and stores for running the plant may be supplied by the contractor with approval of engineer-in-charge. The staff of the contractor so permitted must be properly skilled to operate the plants and equipments concerned.

15. RESPONSIBILITY FOR DAMAGE TO CONTRACTOR'S MATERIALS:
The BBJ administration shall not be responsible for any loss or damage to the contractor's materials, equipment, tools and plants due to fire, flood or any other cause whatsoever. The materials issued by the BBJ to the contractor for use in the work shall be treated as contractor's materials for this purpose and the contractor shall make good the materials in the event of any loss or damage thereto. Part of the work finished but not taken over by the BBJ shall be treated as contractors materials for this purpose and the contractor shall be responsible for making good any loss or damage thereto.

16. The Precast RCC Bed Block will be lifted on abutment with the Contractor's Crane or any other method suitable in the placement. The agency will satisfy the Engineer-in-Charge by trial it on the ground before actual placement on the Pier/Abutment without any extra payment.

17. The work has to be completed within completion period. Tenderer will submit the PERT/CPM chart in Bar chart format as appreciation of work Activities involved and monitoring of work activities at following stage:-

(i) Tender Stage – As part of Bid
(ii) On award of work- i.e, within one month of issue of Letter Of Acceptance (LOA)
(iii) Periodic up-dates during Project duration

Tenderer is required to submit PERT/CPM chart in Bar chart representation with logically linked work activities, Start & Finish Milestone on a Time Scale representing the entire Project duration using Project Monitoring software like Primavera, MS Project etc. Following stages of submission of Works Programme Schedule is essentially required.

Detailed Works Programme Schedule to be submitted within 07 days of award of work. On approval by BBJ, this shall be referred to as Master (approved) Works Programme Schedule. This shall have activities broken down to weekly level.

The approved Works Programme Schedule shall be the basis for monitoring progress at work site.

Quarterly (3 months) Up-dates of the Works Programme shall be submitted by contractor to capture actual field progress and to project the targeted date of completion (TDC). In case of delay in completion date Tenderer would be required to compress few activities, reverse if required his sequence of work, and submit the revised Works Programme Schedule for Works monitoring at site.

18. All incidental works in connection with the subject work shall be carried out by the tenderer at his own cost.

19. The work is required to be carried out during day/night time and under traffic blocks. No claim will be entertained by Railways, if a traffic block is not granted on stipulated date or is cancelled early due to unavoidable circumstances.

20. Detailed contractor's design and drawing, for launching of girder, have to be submitted by the tenderer for BBJ / Railway's approval or their authorized Institution.

21. A temporary site office with attached w/c, furnished table & chairs to be provided at bidder's/ agency's cost for BBJ and Railway's representatives as per requirement. The tenderer will make arrangements for transport of Inspecting officials of BBJ /RDSO/ Railway's to the site/ fabrication shop/ manufacturers/ suppliers etc. throughout the duration of work.

22. Testing of samples of structural steel: The Test Certificates of the structural steel from the manufacturer shall be submitted by the tenderer, when required by the BBJ / Railway's Engineer. The contractor shall take samples from structural steel delivered at site and shall arrange for the samples to be tested by an approved testing agency. Test certificates from that agency shall be submitted to the BBJ / Railway's Engineer.

23. A means of communication at site will have to be provided through out the duration of the Project at sites by the tenderer.

24. **A portable micro processor based system for keeping quality control records in real time and Works Programme Schedule should be kept at sites by the tenderer.**

25. Girder erection & launching scheme is to be submitted by the contractor with calculations to BBJ/ Railway for prior approval.

26. Components of released girders after de launching and dismantling are to be transported and kept in a safe location/store at nearby station as directed by the BBJ / Railway.

27. Proper record of all the above activities has to be maintained by tenderer. A weekly appraisal should be sent to BBJ / Railway till completion of the work by tenderer through courier/ E-mail.

28. The contractor should submit edited version of Video Film in 3 nos of VCD of 3hrs. duration For each bridge site covering all major activities carried out at site taken over multiple spells.

29 Unless otherwise specified, the unit rate for all items in the schedule shall include the cost Of following:-

29.1 The cost of all arrangements for crossing frequently all obstructions, in course of work, over land or across water and the cost of providing and maintaining approach, service roads and temporary bridging that may be necessary for bringing and removing the construction plants, machineries and materials to and from the site of the work, including rent for use of private land and/or compensation for damage, if any, to the intervening private land by such approach service roads.

29.2 The cost of all labours and materials construction plants, tools, equipments, steel rivets, shuttering, shoring, staging, centering, boxing, scaffolding, de-watering and other temporary works or what so ever arrangements required for the satisfactory completion of the work.

29.3 The cost of safety precautions for labour, vehicles construction plant and equipments while working. This also includes extra safety precaution required due to working on a girder Bridge on shore spans as well as on spans having flow of water.

29.4 The cost of all wastage and wash away whether due to rains or storm or flood or other causes what so ever.

29.5 The cost of removal of all obstructions like trees bushes along with their roots, heavy grass, Shrubs at the site of work.

29.6 The cost of all paints, brushes, linseed oil, labour etc. required for painting of all steelworks and dipping or rivets before riveting.

29.7 The cost of fuel, equipment, compressed air and associated items needed for riveting, Removal or rivets and re-riveting.

29.8 The cost of construction, repair, widening of approach roads, waterway crossing, detour etc. for reaching site of work off or leading of plant & machinery and girder components to site. Any rent or hire charge for private/Govt. land and shall also be to contractor's account.

29.9 The contractor shall make his own arrangements for safe custody of the BBJ / Railway materials issued to him and transported to the site of work. No extra payment shall be made on this account.

29.10 The Contractor shall maintain proper ledger for accounting the materials received from Stacking yard at site and taken out from there for utilization in the work. The record shall be kept in a manner as directed by the BBJ / Railway's Engineer-in-Charge.

29.11 In the interest of the contractor, he shall get materials issued to him to the extent required for work as per specifications. Any excess quantity of materials received by him and transported shall be returned to the BBJ / Railway depot at his own cost.

30 Before any demolition work is commenced and also during the process of the work:-
30.1 All roads and open areas adjacent to the work site shall either be closed or suitably protected.
30.2 No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
30.3 No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.

31 All necessary personal safety equipment as considered adequate by the Engineer-in-charge should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by those concerned. No worker will be allowed at site without using Helmet. Sufficient no. of good quality helmets should also be kept available for BBJ / Railway officials during inspections.

Those engaged in welding works shall be provided with welder's protective eye sight lids.

32 When the work is done near any place where there is risk of drowning, all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any persons in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work. Use of life jacket & safety belt is compulsory for all workers at such locations.

33 Use of hoisting machines and tackle including their attachment anchorage and supports shall conform the following standards or conditions:

34.1 These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good repair and in good working order.

34.2 Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.

34.3 Every Crane Driver or hoisting appliances operator shall be properly qualified and no person under the age of 21 years shall be in-charge of any hoisting machine including any scaffolding.

34.4 In case of every hoisting machine and of every cabin ring, shackle, swivel and pulley block used

in hoisting or as means of suspension safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly Marked within the safe working load.

34.5 In case of a hoisting machine having a variable safe working load, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machinery or any gear referred to above in this paragraph shall be loaded beyond the safe Working load except for the purpose of testing.

34.6 In case of departmental machine the safe working load shall be notified by the Electrical / Mechanical Engineer-in-charge. As regards contractor's machines, the contractor shall notify safe working load of the machine to the BBJ / Railway's Engineer-in-charge whenever he brings any machinery to site of work, get it verified by the Electrical/Mechanical Engineer concerned.

35 Motors, gearing transmission, electric wiring and the dangerous part of hoisting appliances should be provided with efficient safe guards, hoisting appliances should be provided with such means will as reduce to the minimum the risk of accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and both as may be necessary should be provided. The workers should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

36 All scaffolds , ladders and other safety devices mentioned or described here in shall be maintained in safe condition and no scaffold ladder or equipment shall be altered or
removed while it is use.

37 These safety provisions should be brought to the notice of all concerned, display on a
Notice board at a prominent place at the work spot. The persons responsible for compliance of the safety code shall be named herein by the contractor.

38 To ensure effective endorsement of the rules and regulations relating to safety precautions, the arrangements made by the contractor shall be open for inspection of Directorate of Factory and Boilers of state or Central Govt./Engineer-in-charge of the Department or their representative .

39 BBJ / Railway's Engineer-in-charge may impose any other condition(s) necessary for a particular work or site

40 (B) Technical Conditions.

41 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 & up to date correction slips to be referred).

41.1 INDIAN RAILWAY STANDARD CODES AND SPECIFICATIONS:
(i) IRS: Bridge Rules(1964)
(ii) IRS: Welded Bridge Code(2001)
(iii) IRS: Steel Bridge Code(1962)
(iv) IRS:B1-2001 for Fabrication and erection of steel bridge girders & BS-110
(v) IRS:M-28 Specifications for electrodes.
(vi) IRS:M-39 Specification for wire flux for SAW.
(vii) IRS: Specification for Erection and Riveting of Bridge Girders.
(viii) IRS: Concrete Bridge Code 1962

41.2 INDIAN STANDARD SPECIFICATION

(i) IS:2062-2001 Specification for structural steel.
(ii) IS:813-1986 Scheme of symbols for welding.
(iii) IS:9595-2001 Manual for metal arc welding.
(iv) IS : 818-2002 Code of Practice for safety and Health requirements in electric and gas welding operations.
(v) IS:102-2001 Specifications for ready mixed paints red lead.
(vi) IS:123-2001 Specifications for ready mixed paints redoxide.
(vii) IS:2004-1996 Carbon steel forgings for general engineering purposes.
(viii) IS:1852-2001 Rolling and cutting tolerances for hot-rolled steel products.
(ix) IS:1148-2001 Rivet bars for structural purposes.
(x) IS:1929-2001 Hot forged steel rivets for hot closing(12 to 36mm diameter)
(xi) IS : 4353-1967 Recommendations of Sub-merged Arc welding of mild steel and low alloy steel.
(xii) IS:456-2000 for plain and reinforced concrete

42 MATERIAL

i) **Contractor has to procure all the raw materials from SAIL, TISCO, JINDAL & Vizag Steel Plant**. **All materials required to complete the work will be supplied by the agerncy / Tenderer.**
ii) All structural section should confirm to IS-2062:Gr.B, fully killed, fully normalized.
iii) All round bars used for making rivets shall be as per IS-1148 & turned bolts etc. shall be manufactured as per IS 1875.
iv) All structural bearing shall be made from steel conforming to IS:2004 & IS 2062 grade B fully killed and fully normalized ultrasonically tested steel section only.
v) All material shall be free from surface defects like notches, dents, bends, excess rolled material, over/under dimensions.
vi) Rolling & cutting tolerances shall be in accordance with IS 1852.

43 Approval from RDSO:-

The contractor will submit the below mentioned schemes for approval of RDSO through BBJ and Railway before starting fabrication of girder. He will comply all the guidelines of RDSO for corrective measure.

i) QAP (Quality assurance plan).
ii) WPSS (Welding procedure specification sheet)
iii) WPQR (Welding process qualification report).

43.1 The Contractor will maintain the Schedule of Technical Requirement before or during execution of works.

44 PROGRAMME AND COMPLETION PERIOD

i) Time being the essence of the contract, the tenderer shall note that in the event of his tender being accepted, he shall be in position to commence the work; immediately & has a definite programme to complete the work in all respects within the completion period.

ii) The tenderer should submit his programme of work as a Bar chart/CPM/PERT in hard copy as well as soft copy along with his tender. This program shall clearly provide for and indicate the time period required for the preliminaries before starting the work and shall indicate the date of commencement and completion of various sections of the work.

45 PROGRESS OF WORK

i) The Contractor shall submit to the BBJ / Railway's Engineer a monthly report based on Bar chart representation of Works Programme Schedule giving progress of works by the tenth of the following month.

ii) It shall be ensured that the works are carried out according to the agreed program and no changes are made except with prior approval or at the instruction of the BBJ / Railway's Engineer - In-Charge at site.

iii) The contractor shall participate in periodical meetings with the BBJ / Railway's Engineer-in-Charge at site to review the progress of the work. In case of a slippage in the time schedule due to the contractor's inability to perform as per the agreed programme, the contractor shall take such action as may be necessary to bring back his work to the schedule, without additional cost to the BBJ, either by resorting to extra time operations, increasing the number of shifts, capacity of construction plants or as directed by the BBJ / Railway's Engineer.

iv) The contractor shall immediately inform the BBJ / Railway's Engineer when there is a or likely to be, any change in his schedule.

46 EXECUTION OF WORK

46.1 INSPECTION OF SITE: **The work of launching shall preferably be done simultaneously from both ends of the bridge**. The tenderer shall in their own interest examine the drawing, conditions of contract and specification of work. They shall also inspect the site and satisfy themselves on their own before quoting for the tender.

46.2 SUPERVISION AND APPROVAL BY ENGINEER: All works embracing more than one process shall be subject to examination and approval by the engineer at each stage thereof, and the contractor shall give the notice to the BBJ / Railway's Engineer or his authorized representative when stage is ready. In default of such notice, the BBJ / Railway's Engineer shall be entitled to check/Verify the quality and extent thereof, even at a later stage at the risk and cost of the contractor.

46.3 EXAMINATION OF WORK BEFORE COVERING UP: BBJ / Railway's officials concerned with the contract shall have powers at any time to inspect and examine any part of the works and the contractor shall give such facilities as may be required for such inspection and examination. The contractor shall uncover any part of works and/or make opening in or through the same, as the Engineer may from time to time direct, for his verification and shall reinstate and make good such part to the satisfaction of the Engineer at his own cost.

46.4 On award of work: The QAP shall be made in full details and include all aspects of materials procurement, documentation for inspection, testing, test certificates & reporting, checks at various fabrication stages, inspection for acceptance of fabricated girders, launching scheme design checks, cross checks at field site, erection etc. The first submission shall be submitted within 1 (one) month of award.

List of QA/QC personnel with defined responsibilities shall also be submitted. The final version shall be finalized and resubmitted within 2 months after award of work incorporating all the changes, comments, and suggestions by BBJ / Railway Officials. The Contractor shall plan his works in a way that pending approval / finalization of QA/QC documents, the works and completion period are not affected.

46.5 Periodic Up-date: Shall be submitted if need arises during the contract period and the contractor shall resubmit with required changes incorporated.

47 TOOLS AND PLANTS

i) All construction plants, temporary works and materials provided by contractor shall when brought to the site be deemed to be exclusively intended for the construction and completion of the work, and the contractor shall not remove the same or any part thereof (save for the purpose of removing it from one part of the site to another) without the consent of the Engineer in writing.

ii) Upon completion of the work, the contractor shall remove from the site the said construction plant

and temporary works remaining thereon and any un utilized materials provided by the contractor.

iii) **The contractor shall make his own arrangement for all construction plants and equipment, tools including spare parts, fuel and consumable stores and all labour required to ensure efficient and methodical execution of work. The quoted rates shall be inclusive of all charges on such items.**

48 NIGHT WORK:
The tenderer may be directed to start night working without claiming extra payment for introducing night work. In the event of night working, the contractor will make necessary/adequate lighting arrangements for smooth execution of work. Contractor may need to work round the clock on all days including Sundays and holidays as per site requirement without claiming any extra charges.

48.1 REPRESENTATION ON WORKS/CONTRACTOR'S SUPERVISION:
The contractor may either supervise the execution of the works himself if he is a qualified Engineer or shall appoint a qualified and experienced Engineer to be approved by the BBJ / Railway to act as his agent. If the contractor fails to appoint a suitable agent as directed by the BBJ / Railway's Engineer the latter shall have full power to suspend the execution of the work until such date as a suitable agent is appointed and the contractor shall be held responsible for the delay so caused to the works.

48.2 REMOVAL OF DEFECTIVE WORKS:
If in the opinion of the BBJ / Railway's Engineer, any of the works had been executed with improper materials or defective workmanship the contractor when required by the Engineer shall re-execute the same and substitute proper materials and workmanship forthwith at his own cost and in case of default of contractor in so doing within a week, the BBJ / Railway's Engineer shall have full power to employ other persons to execute the work and the works and the cost thereof shall have to be borne by the contractor.

49 MAINTENANCE PERIOD:
On the completion of the work to the satisfaction of the Railway, it will be taken over. From the date of taking over, the contractor shall be responsible for maintenance of the work for further period of **twelve months** covering the defects attributed to the contractor. The contractor shall make good and remedy at his own expense within such period as may as stipulated by the BBJ / Railway's Engineer, any defect which may develop or may be noticed before the expiry of his period of **12 months** and intimation of which has been sent to the contractor within 7(seven) days of the expiry of the said period by a letter sent by hand delivery or by registered post or through online. In case the contractor fails to make adequate arrangements to rectify the defects within seven days of the receipt of such notices, the BBJ / Railway's Engineer may without further notice make his own arrangement to rectify the defects and to the cost of such rectification shall be recovered from the Security Deposit of the contractor.

50 ERECTION SCHEME:
The contractor shall submit in triplicate detailed design calculations of the erection scheme proposed to be adopted with such plans, sketches and other details as may be necessary in order to determine the soundness of the methods proposed in general and the erection stages in particular. The methods adopted shall not under any circumstances, subject the materials of the girder spans to any greater stresses than those specified in the Indian Railways Standard Specifications, Codes and Rules. One copy of these documents will be returned after approval or with instruction for modifications as may be considered necessary.

Any approval given by the BBJ / Railway or their authorized Institution for this purpose shall in no way absolve the contractor from full responsibility for the soundness and the safety of the erection methods that may be finally adopted by him, as well as for delivering the finished structures in accordance with the approved drawings and specifications. In this regard, the sole responsibility rests

with the contractor for the execution of the contract in all respect.

50.1 ERECTION AND EQUIPMENT
i) The Contractor shall provide at his own cost all tools and 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.

ii) Before starting the work the contractor shall inform the Engineer fully as to the method he proposes to follow and about the type equipment he proposes to use which shall be subject to the approval of the BBJ / Railway's Engineer. The approval of the BBJ / Railway's Engineer shall not be considered as relieving the contractor of the responsibility for the safety of his method or equipment or from carrying out the work in full accord with the Drawings and specifications.

iii) All temporary works shall be properly designed and subsequently constructed for the loads which it will be called upon to support. Adequate allowance and provision of lateral forces and wind loads shall be made according to local conditions.

iv) Careful and periodical inspection of plant 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.

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

vi) Temporary bracing shall be provided to take care of stress from erection equipment or other loads carried during execution.

50.2 **Contractor has to make his on service road** for carrying materials and equipments to site, no separate payments for this purpose. If any casting of concrete/brick on piers/abutments hinder for staging will be removed before launching of girder free of cost by dismantling without further damaging the part of the structure. Special trolley for girder for carrying/launching of required load capacity to be fabricated at contractor's cost if not given by the contractor. Lifting of existing girder to be done to required height before launching to maintain the same top level of the new and old girders with contractor's required jacks, tools, plants, wooden, packing planks, wooden blocks, labour etc. If any tools, plants, machinery, C. C. Cribs launching trolley of Railway used by the agency necessary hire charges will be recovered from the bill.

50.3 (i) **The girder will be erected as per launching scheme approved by the BBJ and Railway.**
(ii) BBJ and Railway reserve the right through the contractor or the same may be operated departmentally also, if so decided subsequently.
(iii) Launching/erection of new girder and de launching of old girder are to be completed in single traffic cum power block in 6 to 8 hrs or so. C.C Cribs and unserviceable sleepers wherever required for staging may be supplied by Railway on hire charges subject to availability.

51 INSPECTION AND PROGRESS REPORTS:
Any defects noticed during inspection in the execution of the work by BBJ / Railway Engineer/ its agent /RDSO shall be rectified or replaced by the contractor at his own cost. The decision of the BBJ / Railway or its inspecting agency /RDSO as to the existence of the defect, the manner in which the defective work has to be rectified or replaced shall be final and conclusive.

52 TESTING OF STEEL WORK DURING AND AFTER ERECTION:
During erection of the girder spans, the contractor shall afford all facilities and permit the BBJ / Railway/ its agent / RDSO to concurrently inspect the field assembly, site riveting and erection of the

spans. All defects revealed during such inspection shall be rectified immediately by contractor at his own cost.

The contractor shall, if required by the BBJ / Railway's Engineer - in – charge, express in writing for the cause of any defect, imperfection or fault under the directions of the Engineer. Unless such defects, imperfections or faults shall be one for which the contractor is liable under the contract, the cost of the work carried out by the contractor in searching as aforesaid shall be borne by the contractor and he shall in such case, repair, rectify and make good such defects, imperfection or fault at his own expense.

53 FIELD RIVETS, BOLTS, NUTS AND SERVICE ACCESSORIES, INSPECTION ARRANGEMENTS EXPANSIION JOINT SHEAR CONNECTOR

i) The work is to include supply of all rivets, bolts, nuts, washers etc., required to complete erection at site with allowance for wastage. The contractor shall be responsible for supplying site rivets of correct length. The length of such rivets shall be verified by snapping a few rivets of each length in the presence of the Inspecting officers for examining whether the holes have been completely filled in by the rivet materials. No extra payment shall be made for such rivets.

ii) **No structural steel for the manufacture of rivets, bolts etc., will be supplied by the BBJ and no extra payment will be made to the contractor for supply of bolts, rivets etc.**

iii) Service bolts and nuts, ordinary plates, washers and drifts for use in the erection of the work shall also be arranged by the contractor at his own cost. On completion of the erection work, these would remain the property of the contractor.

iv) In the fabrication of Girder necessary arrangements and provision shall be kept for inspection facilities underneath the girder.

54 MANUFACTURE AND ERECTION:

i) The contractor shall observe sufficient accuracy in the assembling and erection of every part of the work to ensure that all parts fit accurately together on erection, and after launching obtaining the desired Camber as per drawings.
ii) The contractor shall maintain a master steel tape of approved make for which he has to obtain a certificate of accuracy from the National Test House calibrated under a tension of 1.8 Kg. at 16.7 degree centigrade.

54.1 The girder will be fabricated in RDSO approved workshop with shop riveted or welding arrangement. The Panels thus received will be assembled at site with proper arrangement of welding and riveting in approved manner.

55 TEMPLATES:

The contractor shall make his own arrangements at his own cost for the templates. No steel in this connection will be supplied by the Railway. The templates used throughout the work shall be of steel of similar category as for the member and of tested approved quality.

56 TEMPORARY STRENGTHENING:

i) The launching arrangement will include not only the supply and fabrication of launching arrangements, but also the supply and fixing of temporary strengthening of Girder members to take care of erection stresses and strains. Erection stresses must be kept within allowable limits at every stage of erection & also to ensure proper camber after erection.

ii) The contractor has to make arrangements at his own cost for the steel for launching arrangements, and the contractor at his own cost, if required, during launching will do temporary strengthening of girders. The rate quoted should take into account in these aspects. The components needing strengthening shall be restored to original state at contractor's own expense.

57 PARTS IN CONTACT:
All steel elements are intended to be riveted or bolted together shall be in contact over the whole surface.

58 PAINTING RIVETS, BOLTS ETC:
All rivets, bolts ,nuts, washers will have to be thoroughly cleaned and dipped in boiling linseed oil to be arranged by the contractor at his own cost, before using. No extra payment will be made on this account.

59 DEFECTIVE RIVETS:
All loose and burnt rivets and rivets with cracked, badly formed eccentric of deficient & defective heads, shall be cut out. The actual method of cutting out shall be approved by the BBJ / Railway's Engineer-in-Charge. Recouping and caulking shall in no circumstances be resorted to such defective rivets / bolts shall be replaced by contractor at his own cost. No extra payment will be made on this account.

60 TEST CERTIFICATIONS:
60.1 All materials for the work should pass tests or an analysis prescribed by the specification mentioned above or to such other recommendations as the BBJ / Railway shall have authorized as equivalent there to or in the absence of such authorized specifications such tests and analysis as BBJ / Railway shall specify or specified by inspecting official will have to be got done by contractor, at his own cost.

60.2 For raw materials like structural steel, rivets, paints etc., the contractor shall furnish copies of Test Certificates from the original manufacturers.

If any testing of material like test for ascertaining normalizing of steel, metallurgical/chemical composition, mechanical strength etc. is required by the BBJ / Railway or their authorized inspecting agency, in respect of any items, this shall be arranged by the Contractor at their own cost as instructed by BBJ / Railways Engineer at site & submitted in the suitable form.

No. of such tests for steel will be limited to no. of heats from which raw material has been manufactured for each type. Test for other material like paint etc will be limited to no. of manufacturing batches from which material has been supplied. If the BBJ / Railway in respect of this and other items require any further testing of materials, the contractor at his own cost shall arrange the same for.

60.3 Any approval given by the BBJ / Railway in consequence of such tests or analysis shall in no way limit or interfere with the absolute right of the BBJ / Railway to reject the whole or portion of such materials supplied, which in the judgement of the BBJ / Railway do not comply with the conditions of the contract. The decision of the BBJ / Railway in this regard shall be final and conclusive for all-purpose.

60.4 All manufacturers' certificates of tests, proof sheets, mill sheets, etc. showing that the materials tested conform to the requirement of the appropriate Indian Standard & other relevant Standard Specifications should be submitted.

61 METHOD OF MEASUREMENT:
i) For the purpose of payment quoted rates apply to the weights of steel work calculated from final working drawings based on theoretical weights given in the relevant IS specification and using minimum square overall dimensions. The final payable weight shall however will not be more than the nominal weight laid down in the Bridge drawings.

ii) The drawings office Despatch lists (D.O.D.Ls) when prepared according to the procedure, are to

be submitted by the contractor to the BBJ / Railways for approval, payment towards erections is to be made only on the quantities indicated in the approved D.O.D.Ls.

62 INSURANCE:
The contractor shall be responsible for all damages and injury caused by their work or workmen to persons, animals or things or to the work of other trades and he shall effect at his own cost any insurance necessary and hold the BBJ / Railways free from all responsibilities in this respect. The insurance must be jointly in the name of the contractors and BBJ / East Coast Railway and the policy kept with the BBJ / Railway's Engineer.

63 DRILLING AND SUB PUNCHING:
i) All holes shall be drilled but the Contractor may, if he so prefers sub-punch them to a diameter 6 mm. less than that of finished holes, e.g. A punched hole width shall not exceed 19mm in diameter for a 25mm dia finished drilled hole. When the rivet 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 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 1.5 mm less in diameter than the size of the punched holes can be passed easily through all the holes. Holes for counter sunk heads of rivets bolts or screws shall be drilled to the correct profile so as to keep the heads flush with the surface.

ii) One sub-punching shall be allowed in the main truss members of open web girders.

64 DRIFTS:
i) Drifts as per IR Specification on B1-2001 may be used for drawing light members into position but their use on heavy members be restricted to securing them in their correct positions. In no case shall drifting be allowed to such an extent that holes get distorted.

ii) Drifts to enlarge un matched holes is prohibited. The holes that will have to be enlarged to admit rivets should be reamed provided the Engineer permits such reaming
after satisfying himself about the extent of inaccuracy and the effect of reaming on their soundness of the structure. The purchaser retains the right to reject all steel work if the holes are not properly matched.

65 MAKING OF JOINTS:-
66.1 Cleaning: (i) All surface which will be in permanent contact after assembly shall be thoroughly cleaned to remove all paint and mill scale down to the bare metal, and shall be painted immediately before being assembled with one coat of zinc chrome yellow, care shall be taken to see that all burrs are removed and no surface defects exists, before the parts are assembled.

ii) All parts shall be thoroughly cleaned and dried before they are painted. Sand blasting or other methods of cleaning shall be done when so specified by the Engineer.

66.2 Bolting and drifting: Only barrel drifts, as per IR specification or fabrication and erection of steel girder bridges and locomotives turntable serial No. B1-2001 shall be used in erection. They may be used for drawing light members into position but their use in heavy members shall be restricted to securing them in their correct position. Any apparent error in shop work which prevents the assembling and fitting up of the parts by the proper use of these drifts shall be investigated immediately. As all work is rigidly inspected in the manufacturer workshop before dispatch, these difficulties should not arise and the cause should be sought in the use of incorrect components or the transposition of a correct part.It is usually important that parts be correctly "handled" at all stages. If error still persists, the matter shall be immediately reported to the Engineer who will decide what action is to be taken. No reaming shall be undertaken without the written authority of the Engineer, except for under drilled holes meant for turned bolts. If approved, the contractor shall supply at his own expense, any special rivets that may be required.

Copies of all correspondence relating to the recourse to reaming and the use of over size rivets shall invariably be sent to the Engineer for information of the inspectorate concerned.

66.3 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.

66.4 Special methods of erection other than those described in Appendix III of IRS B1-2001 for fabrication & erection of steel girder Bridges & Locomotive Turn Tables & in case where the joints have to withstand stresses arising from special methods of erection ,provision is to be made to keep the whole stress that will or may occur within permissible limit. 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 maximum of 50% of the service bolts, 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 drift bolts will be intimated by the Engineer. Then conditions of clause 20.3 of IRS - B1 - 2001 must be observed and the bolts fully tightened as soon as the Joint is made.

66.5 Where the manufacturing of girders has been done in accordance with clause 34 of IRS-B1 -01 relating to steel girder bridges, the erection shall be done in accordance with Appendix III of IRS. However, if the Contractor desires to adopt any other method of erection he shall submit the scheme and obtain the approval of the Engineer. It shall be ensured that when in position the girder has the requisite camber.

66.6 EMERGENCY JOINTING: In the event of an emergency arising such as, the staging is in danger of being carried away by the floods before the riveting can be completed the joints shall be made secure by filling 40% of the holes with cylindrical drifts and an equal number with service bolts fully tightened.

67 BEARINGS AND ANCHORAGES:

i) Bed plates shall be set to required level and fixed accurately in position by giving full and even bearing by setting them on a layer of cement, sand and materials as approved and directed by the Engineer.

ii) The contractor shall drill the holes where necessary and set the anchor bolts. The bolts shall be set accurately & fixed with cement grout or any other grouting material as approved by the BBJ / Railway's Engineer, completely filling the holes.

68 RIVETS AND RIVETTING:

68.1 The dimension on the drawings refers to the diameters of the rivet holes and their finished rivets.

a) The rivet holes shall be 1.5mm greater than the diameter of the rivet bars used. The rivets shall be made to specification IS:1929.

b) The shanks of the un driven rivets shall be made of a length sufficient to fill the holes thoroughly and to form head.

c) The clearance i.e. the difference in diameters between the rivet measured under head before being heated and the rivet hole shall not be less than 0.75mm.

d) Before riveting is commenced, all works shall be properly bolted up so that the sections being riveted are in close contract throughout.

e) Rivets shall completely fill the holes and shall be properly bolted by means of pressure or percussion riveters of approved design.

68.2 All rivets shall be properly heated to straw to heat full length of the shank, firmly backed and closed. The head of the rivet, particularly in long rivets, shall be heated more than the point and in No case shall the point be heated, more than the head. Sparking or burnt rivets shall not be used.

Where it is impossible to back up by normal method of holding up, 'double gunning' may be resorted.

68.3 Gauges for rivet dimensions and contours shall be provided by the Contractor for the use of the Inspecting Officer. Rivets driven shall completely fill the holes, have the heads concentric with the shanks and shall be in full contact with the surface. Driven rivets when struck sharply on the head with the 110-gm. Rivet testing hammer, shall be free from movement and vibration.

68.4 While riveting built up members, great care should be exercised to ensure that the set of holes for field rivets in each flange of the buildup member is aligned and not 'aborted'. Use of special jigs shall be made to ensure this.

68.5 All loose and burnt rivets with cracks, badly formed eccentric or deficient heads shall be cut out and replaced free of cost by good rivets. Permissible deviation of driven rivets shall be as per Appendix-IV of IRS BI-2001. Rivets shall also be cut out when required for the examination of the work. Actual method of cutting out shall be approved by the BBJ / Railway's Engineer. Recouping and caulking shall in no circumstances be resorted to.

68.6 Riveting shall not be started till such time the BBJ / Railway's Engineer has personally satisfied himself that the alignment of the girders is correct, laterally and in verticals plum, the camber according to that shown of the camber diagrams with camber jacks screwed tight, all the joints and Cover mates well up, service bolts tight and field rivet holes coinciding.

68.7 Surfaces which are in accessible after riveting during erection shall be given one coat of zinc chrome yellow. The work shall be kept tightly bolted together while it is being riveted. Special care should be taken that service bolt are frequently retightened as the riveting proceeds, the no. and position of the drifts used in the joints shall not be more than the permissible at any stage. All field rivets shall be tested as directed by the BBJ / Railway's Engineer.

68.8 Wherever practically possible all riveting shall be done by Pneumatic or hydraulic riveters. The working pressure to be employed when using pneumatic or hydraulic tools shall be approved by the BBJ / Railway's engineer. Hand riveting shall only be done when sanctioned by the BBJ / Railway's Engineer. In such cases means shall be adopted to ensure the rivets being used in their entire length so as to fill the rivet holes completely, the snap being used only to give the correct form of head.

68.9 When all the rivets of joints have been finally passed they shall be painted with two coats of epoxy high build paint to RDSO Specification No.M&C/PCN/111/88 followed by two coats of Paint Aluminium to IS; 2339.

69 GENERAL AND INFRASTRUCTURAL REQUIREMENTS FOR STEEL GIRDER.

69.1 1. **The fabricator must have adequate organization including supervisors, skilled worker and adequate manpower, machineries to execute the fabrication work in a competent manner.**

2. **Steel sections for fabrication of steel girders shall be obtained from firms viz. SAIL/TISCO/JINDAL/Vizag Steel Plant. Manufacturer's Test Certificate to be produced.**

3. A proper organization must exist to perform the functions of purchasing of various raw materials and consumables etc. and maintaining related inspection certificate, test certificate etc.

4. Previous experience of fabricating steel structures capable of withstanding dynamic load such as bridge girders, microwave towers, pressure vessels, heavy road vehicles etc. is essential. They should have I-house testing facility.

5. A proper procedure for maintenance of records for receipt and consumption of raw material should

be in vogue or developed so as to permit verification by BBJ / Railways' Representative.

6. Adequate power supply should be available through distribution agencies and adequate back up should be available through captive generation.

7. Covered bay area served by EOT cranes of mechanically operated machines should be available to handle day-to-day fabrication of girder components.

8. Enough area to store raw material, sub-assemblies and finished products should be available. The area provided should be enough to store raw material, to execute the work order for requirement of steel. Suitable material handling facilities in form of EOT/mobile crane should be available.

9. Covered shed area protected from rain, dust etc. should be provided for surface preparation /painting /metallising of steel girders. As no part of the work shall be painted unless it has been finally passed and cleared by inspecting officer, adequate space for storing fabricated component awaiting painting shall be available. The tenderer should get the templates approved by BBJ / Railway's Engineer before fabrication. Scheme/sequence of fabrication should also be got approved by the BBJ / Railway's Engineer.

10. For full-scale layout of drawing to which girders are to be manufactured, template shop with steel/concrete floor should be available. For symmetrical girders, central half of the layout may be done and for non-symmetrical girders full length layout shall be required. Further, for the development of jigs and fixtures this shop should have in-house jig manufacturing facilities.

11. Sufficient space for trial erection of the girders after manufacture shall be available. For this purpose, proper handling equipment, stacking space and other facilities shall be available.

12. An adequately equipped and staffed drawing office is required for the preparation of fabrication drawings. Fabrication drawings should be got approved by BBJ / Railway's Engineer.

70 ADDITIONAL SPECIAL TECHNICAL CONDITIONS FOR FABRICATION OF WELDED STEEL GIRDERS

71 FABRICATION PROCESS:

71.1 The contractor shall make his own arrangement at his cost for the full scale templating on high level steel/concrete platform under covered shed and making of steel template hereafter referred as masters of each and every component type. The BBJ will supply no steel in this connection. The templates used throughout the work shall be of steel and will be used for making jigs and subsequent checking and repairs to jigs only. Work of fabrication shall be done as per **IRS specification No. B-12001 and IRS welded Bridge Code 2001.**

71.2 In the case of any conflict between conditions described hereunder and various specifications to be followed as mentioned in the contract document at various places these conditions shall prevail over all conditions mentioned elsewhere. Work of fabrication shall be done as per IRS Welded BridgeCode–2001. Electrodes shall conform to IRS Specification No. M-28. The filler wire and flux combination of submerged are welding shall conform to IRS Specification No. M-39.

Before starting, the work contractor shall submit detailed welding procedure sheet. The welding procedure sheet shall include specifications of the parent metal and electrodes and /or wire flux combination Voltage/Amperage, wire feed speed, travel speed etc. Location, sizes, actual lengths and details i.e. from joint, angle between fusion faces, gap between parts etc. of welds. Welding procedure like welding/ sequence, pre-heating, post-heatingetc. Ability of the operator / welders employed by the contractor to produce welds of the required strength. The above procedure shall be approved by the BBJ / Railway/RDSO before commencement of the work.

The tolerances in manufacture of the girders shall be as per special fabrication tolerances as applicable to welded girders as laid down in IRS Specification No. B-1/2001.

72 WELDING PROCEDURE:

72.1 Provision of IS-823-1964 and IS-4353-1967, shall generally be followed, as applicable, for welding procedure, details of workmanship, correction of weld faults, peeling, painting, etc. In case, any of the provisions contained therein contravene the provisions made in Railway Welded Bridge Code, the latter shall be followed.

72.2 No welding work shall be given to a contractor who does not produce satisfactory evidence of his ability to handle the work in a competent manner. The contractor shall also prove the ability of the Operator/Welders employed by him to produce welds of the required strength. The contractor shall employ a competent welding Supervisor to ensure that quality of materials and the standard of workmanship comply with the requirements laid down in the IRS welded bridge code.

72.3 The sizes and length of welds shall be not less than those specified in the drawings, nor shall they be substantially in excess of the requirements without prior approval of the Engineer. The location of welds shall not be changed without prior approval of the BBJ / Railway's Engineer. Welds shall preferably be made in flat position.

72.4 The preparation of fusion faces, angle of preparation, root radius and root face shall be as specified in IS:823-1964, and IS:4353-1967. Where the gap between the root faces of a butt joint is excessive, the gap shall not be bridged since this procedure often leads to cracking. The fusion faces of the joint shall be build-up with weld metal to give the appropriate gap before the weld proper is commenced.

72.5 Splices in each component part of a solid web girder or built up member shall be made before such component part is welded to other component part of the member. Splicing shall be done at approved location only for making up section of larger length.

72.6 In making welds under conditions of severe external shrinkage restraint, the welding shall be carried out with electrodes having Type 6 covering.

72.7 In case of welding using direct current, earthling on the work piece to be welded shall be connected carefully at more than one location with a view to avoid "Arc Blow" during welding.

72.8 The sequence of welding shall be such as to minimize distortion/deformation. Whenever possible the members which offer the greatest resistance to compression are welded first.

72.9 All slag shall be removed from each run before another run is super-imposed and from the final run. When cold, the final run shall be protected with clean boiled linseed oil and shall not be painted until approved by the Inspector.

72.10 Adequate means of identification, either by identification stamp or other records, shall be provided to enable each weld to be traced to the welding operator by whom it was made.

72.11 During the entire welding and cooling cycle, the joints shall not be subjected to any external forces or shocks.

73 SUB-MERGED ARC WELDING:

73.1 All possible components shall be welded by sub-merged arc welding as instructed by RDSO. Neither the depth of fusion nor the maximum width in the cross section of weld metal deposited in each weld pass shall exceed the width of the face of the weld pass.

73.2 All butt welds by the submerged arc process shall be made in the flat position. Fillet welds may

be made in either flat or horizontal vertical position. The size of the single pass fillet welds made in the horizontal-vertical position shall not exceed 8 mm.

73.3 In addition to the provisions of IS:4353-1967, the Inspector may, where deemed necessary, require a sample joint having the same cross-section as the joint to be used in construction and a length of at least 300 mm to be welded with the wire, flux, current, arc voltage and speed of travel that are proposed to be used and a macro etched cross section of the welded joint prepared as a demonstration that the specified requirements will be met. When the welding current, arc voltage and speed of travel are established by a test made in accordance with requirements of this clause, they shall be kept within the following limits of variations:

WeldingCurrent….+10%
Arc voltage …..+ 7 %
Speedoftravel……+15%
Submerged Arc welding machine for heavy duty bridge girders as per IS: 4353-1967.

74 Operator's Qualifications:
The welders/ operators employed for mechanized welding/ SAW should be trained in accordance with IS-817- 1966. The welders shall be subjected to appropriate qualifying test specified in IS: 1181-1967 as per the format of Annexure B-10.

75 Edge preparation and set-up of parts:
75.1 Edge preparation shall conform to the relevant drawings and meet the requirement of Welding bridge code with milling machine. Normally all edges to be welded will be mechanically planed before members being subjected to welding.

75.2 After the parts are assembled in position for welding, the inspector shall check for incorrect root gap, improper edge preparation and other features that might affect the quality of welded joint.

76 INSPECTIONS AND TESTING OF WELDED JOINTS:
76.1 Inspection of the welded bridge girders shall be entrusted to RDSO as per clause 27 of IRS Welded Bridge Code.

76.2 The Inspector designated by the purchaser shall ascertain that fabrication by welding is performed in accordance with the requirement of welded Bridge Code.

76.3 Contractor shall notify in advance of the start of any welding operation.

76.4 Contractor shall provide free access to the work being done at all reasonable time and facilities shall be provided to the inspecting authority so that during the course of welding, he may be able to inspect any layer of weld metal. The inspecting authority shall be at liberty to reject any material that does not conform to the provision of welded Bridge code and to require any defective welds to be removed and re-welded.

77 Marking of Defective Welds:-
77.1 The marking shall be positive and clear and in accordance with the method of marking followed and understood by the Inspectors and shop personnel involved in making the repairs.

77.2 Marking shall be permanent enough to be evident until the repair has been done and inspection completed.

77.3 After the repair has been made, it shall be inspected and properly marked to indicate whether the repair is satisfactory.

78 Extension pieces:

Infusion welds such extension pieces are to be welded which will serve the additional functions of running in/out pieces to ensure the soundness of full length of the weld. Extension pieces will be of the same composition and with same weld preparation as the parent material of the main weld.

79 Radiographic Test:
All Butt welds shall be examined by appropriate Radiographic or any other equally effective method as specified in the drawing or procedure sheet.

80 Dye Penetration Test:
Other weld may be examined by Radiographic or any other nondestructive method like dye penetration test, Magna flux and / or any other method at the discretion of the Inspecting Authority.

81 Welding Parameters:
Contractor has to keep a record of welding parameters piece wise, component wise and span wise.

82 INSPECTION AND PROGRESS REPORT:
82.1 The raw material and fabrication work shall be inspected by BBJ / RDSO or Railway through their authorized Engineer for which free accommodation and inspecting facilities will have to be provided by the contractor. The work of fabrication in contract or's fabrication shop will at all times be open for inspection by the BBJ / Railway or their authorized agents. Before dispatch of fabricated steelwork from the shop, they will be inspected in the contractor's workshop by the BBJ / Railway or their agent who will thereafter issue inspection certificates. The tests will be carried out at contractor's cost. All facilities as required for carrying out the inspection will be provided free of cost by the contractor including those requiring the services of outside agencies & all measuring tools, gauges, template etc.

82.2 Any defects noticed during inspection in the execution of the work shall be rectified or replaced by the contractors at their own cost. The decision of the BBJ / Railways or its inspecting agency as to the existence of defect, the manner in which the defective work to be rectified or replaced shall be final, conclusive and binding on the contractors. No extra claim, whatsoever, shall be entertained for the cost of such rectification or replacement.

82.3 The progress of fabrication of steel work as well as execution of all works shall be subject to periodic review by the BBJ / Railway Administration.

82.4 The contractors shall provide all facilities to the BBJ / Railway's representative to make periodical detailed assessment of the progress of the works. Such information and progress reports as may be called for by the BBJ / Railway and at such intervals as specified shall also be made available.

83 SURFACE TREATMENTS FOR BRIDGE GIRDERS (RIVETED/WELDED):

83.1 General:
1. No component to be given any surface treatment without component being passed and embossed by BBJ / Railway's Authorized Inspecting Agency.

2. Surface cleaning, for components not to be metallized, will be done by using mechanized wire brush and / or shot blasting and the application of the paint can be done either manually with brushes or by mechanical means to the satisfaction of the BBJ / Railway's Engineer. No painting work will be permitted during the monsoon period from June to September.

84 PREPARATION OF SURFACE FOR PAINTING:
Surface cleaning will be done by using wire brush or shot blasting and the application of the paint can be done either manually with brushes or by mechanical means to the satisfaction of the Engineer. No painting work will be permitted during the monsoon period from June to September.

84.1 Protective painting: Protective coating by painting as per following painting schedule may be applied with the approval of the Engineer In-charge.

84.2 Primer coat: One coat of Primer zinc Chrome Yellow to IS: 104 followed by primer one coat of Zinc Chromate Red oxide to IS:2074 to a total minimum thickness of 40 microns. One coat of Aluminium paint to IS: 2339- 2001 to 20 microns minimum DFT shall be applied over the primer coats before the fabricated steel work leaves the shop.

Surface which are inaccessible after riveting shall be applied one coat of epoxy high build paint to RDSO Specification No.M&C/PCN/111/88 to a DFT of 100 microns. The work shall be kept tightly bolted together while it is being riveted.

All rivets, bolts, nuts, washers etc. are to be thoroughly cleaned and dipped into boiled Linseed oil to IS:77- 1976.

All machined surface are to be well coated with a mixture of white lead to IS: 33-1992 and Mutton tallow to IS: 887 – 1977.

84.3 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.

84.4 SITE PAINTING:
After the steel work is erected at site a second covering 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.

85 ELCOMETER:
Minimum two digital Elcometer will have to be provided by the contractor at his own cost for determination of metalising / painting thickness and on completion of the work, the same will be handed over to BBJ / Railway without any cost. One of the digital Elcometer will have measuring range of 0–100 micron & other will have a measuring range of 50-250 micron.

86 ADHESION:
The sprayed metal coating shall be subject to an adhesion test using the following method:-
"Using a straight edge and hardened steel scriber which has been ground to a sharp 30 Degree point, scribe two paralleled lines at a distance apart equal to approximately 10times the average coating thickness. In scribing the two lines, apply enough pressure on each occasion to cut through the coating to the vase metal in a single stroke."

If any part of the coating between the lines breaks away from the base metal, it shall be deemed to have failed the test. Components, which have been rejected, shall have the defective sections blasted clean of all sprayed metal prior to re-spraying 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 if the surface has been kept dry and is free from visible contamination.

87 TRANSPORTATION OF GIRDERS & GIRDER COMPONENTS:
No components are to be transported to site without being rendered surface treatment as described above.The contractor has to transport with loading/unloading and stacking all the fabricated material including loose fittings with his own truck/trailer, tools, plants & machinery and labour etc. at his own cost.

Contractor will have to make his own arrangement at his own cost for motorable approach road. The contractor has to arrange wooden Gutaka / Sleepers to keep the material at least 12" above the ground level. The contractor has to take all precautions during transportation/loading / unloading/stacking to avoid damage to fabricated material. If any damage to any of the members is

caused, the particular components will be rejected by the Engineer-In-Charge at site or his representative. Any material found damaged during transit and/or unloading will be stacked separately & damaged portion shall be marked by white paint.

Contractor will have to organize rectification/replacement of all such defective component at his own cost to the entire satisfaction of the Engineer or his Authorised Representative.

All trucks/trailers are to be loaded in such capacity as to ensure safe transport of fabricated materials

88 Following specifications shall be followed:-

☐ Indian Railway Steel Bridge Code as corrected up to date.
☐ Indian Railway Welded Bridge Code1972.
☐Indian Railway Schedule of Dimension for Broad Gauge1 939(Reprinted in Metric Units in 1973).
☐ IS2062-1992GR-A Specifications for Structural Steel Standard Quality.
☐ Indian Railways specification B-1,2001:Fabrication and erection of Steel Girder Bridges.
☐ IRSH-5 rivets.
☐ IS2155-1962:Rivets for General purposes (Below 12 mm diameter).
☐ IRSH-19,for bolts and nuts.
☐ IS2074, Ready mixed paints, Red Oxide Zinc Chromate.
☐ IS:2339-1963:Aluminiumpaint.
☐B.S.S.916 and/or IS:1963-1967: black Hexagonal Bolts/ Nuts etc., Black Hexagonal Bolts /Nuts and lock nuts (6 to 39mm) and black Hexagonal screws (dia 6 to 24 mm).
☐ IS:800-1984.
☐ IS:1148-1973:Hot Rolled Steel Rivet Bars for Structural purposes.
☐ IS:2062-1992:Steelgrade‘B’forstructuralpurposes.

89 The tenderer/s shall maintain the master- steel tape of approved make for which he has obtained a certificate of accuracy from the National Laboratory. Rolled materials before being laid off or worked, must be made straight. If straightening or flattening is necessary, it shall be done by method that will not damage the material. Sharp kinks and bends shall be rejected.

90 Holing:
Holes for rivets and bolts shall be drilled to conform to Cl.10 of IS:7215. All holes, excepts as stated hereunder shall be drilled to the required size or sub punched 2mm. less in diameters and reamed thereafter to the required size.

Thickness of the materials for sub punching shall not be greater than 16mm. All matching holes, for rivets or bolts shall register with each other so that a gauge of 0.8mm. less in diameter than the holes can pass freely through the members assembled for levelling or bolting in the direction at right angle to such members.

All holes for turned and fitted bolts shall be drilled under sized by 1mm. and after assembly reamed to a tolerance of 0.13mm- 0mm. unless otherwise specified. When
the number of members to be riveted in assembly exceeds three or the total thickness is
90mm. or more, the holes shall be drilled or reamed in position after assembly except when seal bushed jigs are used.

The parts shall be finally bolted together during such block together during such block drilling and taken apart for removal of burrs after drilling. Holes in purlin, side sheeting runners, packing plates and lacing bars may be punched full size, provided the thickness of the materials does not exceed 13mm. All punching and sub punching shall be cleared and accurate and all drilling shall be free from burns. No holes shall be made by Gas Cutting process.

91 Bolting:

All turned and fitted bolts shall be carefully turned and shall be paralleled throughout the barrel. The following limits of tolerance shallbe permitted upon the diameter of the barrels of turned bolts and holes, which they are to fit.

Limit of Tolerance	Barrel of Bolts	Holes
High	0.00mm	+0.13mm
Low	0.13mm.	–0.00 mm.

The barrels of each turned bolts shall be of such a length so that it is in full contact with the work throughout the screwed portion, being made at least 1.6mm. less in diameter that the barrel or to suit the next smaller size of metric screw thread. The barrel portion shall be jointed to the thread portion by a degree chamfer within the thickness of washer, unless otherwise specified. Faces of heads and nuts bearing on steel work shall be machined.

All such bolts shall be provided with washers having a hole of 1.5mm. larger in diameter than the barrel and thickness of not less than 6mm. so that the nut, when tightened, shall not bear on the unthreaded body of the bolt. In all cases where the full bearing area of the bolt is to be enveloped, the threaded portion of the bolt shall not be within the thickness of the parts bolted together. The threaded portion of each bolt shall project through the nut by at least one thread. Tapered washers shall be provided for all heads and nuts bearing on beveled surface.

92 Welding:-

92.1 General: The welding and welded work shall generally conform to IRS bridge code and subject to further specifications given in the following paragraphs. Only welder possessing competency certificate may do manual metal arc welding, or where access of the location of welds do not permit automatic welding.

The welding should be done by submerged arc welding process either fully automatic or semi automatic wherever specified by the BBJ / Railway. Except for special types of edge preparation such as single and double 'U', single and double 'J', the fusion edges of all the parts which are to be joined by welding may be prepared by using mechanically controlled automatic flame cutting equipments and to be ground to a smooth finish special edge preparation should be made by machinery or gauging.

All welding work shall be done in shops and the Layout and sequence of operation shall be so arranged as to eliminate distortion and shrinkage stresses.

92.2 Electrodes: All electrodes shall be kept under dry conditions. Any electrode with parts of its flux coating broken away or otherwise damaged shall be rejected. Any Electrode older than six months from the date of manufacture or older than the date of expiry as specified by manufacturer should not be used.

Welding electrodes to be used in the work should conform to RDSO approved Firm and quality only. The electrodes to be used should be Class A2 of IRSM-28 and wire for Co2 welding shall conform to Class I of IRSM-46. The electrodes to be used in the work shall be of approved type and manufactures approved by RDSO.

92.3 Preparation of joints: The edge shall be prepared with an automatically controlled flame cutting torch correctly to the size and dimension of the groove prescribed in the design and shop drawing. In case of "U' grooved joints the edges shall be prepared with an automatic flame torch on two phases following a bevel out with grounding pass or by machining. The welding surfaces shall be smooth, uniform and free from fine tears notches or any other defects which may adversely effect welding and shall be free of loose scales, slag rust, grease, paint, moisture or any other foreign material.

92.4 Welding Procedures: The welding procedure shall be arranged by the contractor to suit the details of the joints as indicated on the drawing and the position at which welding has to be carried out. Working procedure shall cover the following:

a) Type and size of Electrodes.
b) Current for automatic welding arc voltage.
c) Length of run for Electrode, or for automatic welding speed of travel.
d) Number and arrangement of runs in multi run welding.
e) Position and set up of parts.
f) Preparation and set up of parts.
g) Welding sequence.
h) Pre or post heating.

92.5 Any other relevant information:
The welding procedure shall be so arranged that the distortion and shrinkage stress are reduced to a minimum and the welds meet requirement and quality specified, hereunder.

Any weld found defective shall be cut by using either a chipping hammer or gauging torch in such a manner that adjacent materials is not injured in any way .

Planning of the welds involving deformation of the surface either during de-slagging operation or thereafter shall not be allowed.

Fusion faces and surrounding surfaces within 50mm. of welds shall be free from all mill scale and free from oil, paint or any substance which might effect the quality of the welds and impede the quality/progress of welding.

They shall be free from irregularities, which interfere with the deposition of specified size of weld or be the cause of defects.

All mill scale within 50mm. of welds shall be removed on welding either by picking followed by through power weld brushing or by other approved methods. If preparation or cutting of the fusion faces is necessary the same shall be carried out by sheering, chipping, gas cutting or flame gauging. Where no Gas cutter or hand gauging is employed the blow pipe or gauging blowpipe shall be properly guided.

93 Assembly for Welding:
Before taking of mass production of any type of sleeper the production of 20 sleepers shall be taken up and the dimensions thereafter shall be checked by means of a test track 13Mtrs. Long assembled at the BBJ's nominated placer. The rails for linking of the steel track shall be made available free of charge by BBJ at a point convenient to the BBJ.

The contractor at his own cost shall do transport of the Rails and sleepers from this point to the Contractors workshop and returning the same to the point of collection. The parts to be welded shall be properly assembled and held firmly in position by means of jigs and fixtures prior to and during welding.

Automatic submerged arc welding shall be employed for fabrication of welded steel channel sleepers wherever specified.

94 Accuracy of fit up:
Parts to be fillet welded shall be brought in to as close contact as Practicable and the gap due to faulty workmanship or in correct fit up shall not exceed 1.5mm. If greater separation occurs at any position the size of fillet weld shall be increased at such position by the amount of the gap.

95 Jigs and manipulators:
Jigs and manipulators shall be used where practicable and shall be designed to facilitate and to ensure that all welds are easily accessible to the operators.

96 Minimum leg lengths for thickness in fillet welds: The minimum leg length of a fillet weld as deposited shall not be less than the specified size. In no case shall a concave weld be deposited unless specifically permitted. Where permitted, leg length shall be increased above that specified, so that the resultant throat thickness remains the same, as would have been by the deposition of a flat faced weld of the specified leg length.

97 De-slugging:
After making each run of welding all slag shall be thoroughly removed and the surface cleaned.

98 Quality of welding:
The weld metal as deposited, including track weld if to be incorporated shall be free from cracks, slag inclusion, porosity, cavities and other de- position faults. The weld steel shall be properly fused with the present steel metal without under cutting or over lapping at the toes of the weld. The surface of the weld shall have a uniform consistent contour and regular appearance.

99 Weather conditions:
Welding shall not be done under open weather conditions which Might adversely affect the efficiency of the welding. It should be done only under a covered shed in a workshop.

100 Qualifications and testing of welders:
The contractors shall satisfy the Engineer that the welders are suitable for the work for which they will be employed shall produce evidence to the effect that the welders have satisfactorily completed appropriate test as prescribed in I.S.877.

The BBJ / Railway's Engineer may at his own discretion order periodic tests of the Welder and/or of the welds produced by them.

101 Supervisor:
The Contractor shall employ a competent welding supervisor to ensure that the standard of workmanship and the quality of materials comply with the requirements laid down in the specifications.

102 Erection marking:
Each fabricated member whether assembled prior to dispatch or not so assembled shall bear an erection mark which will help to identify the member and its position in respect of the whole structure to facilitate re-erection at site.

These erection marks shall be suitably incorporated in the shop detail and erection drawings.

103 CONTROL IN THE FABRICATION AND ASSEMBLY OF VARIOUS STRUCTURES:

104 Criteria for testing:
The contractor shall conduct tests in accordance with the following norms.
a) Visual examination 100%(one hundred percent).
b) Mechanical Test.
c) Dye Penetrate Examination.

105 Tests:

106 Visual Examination:
The Contractor shall conduct the visual examination and measurements of the external dimensions

of the welds for all joints. Before examining the welded joints surface area close to it on both side of the weld for a width not less than 20mm. , shall be cleaned of slag and other impurities . Examination shall be done by a magnifying glass which has a magnification power of 10 and measuring instruments which has an accuracy of + 0.1mm. Or by weld gauges. Welded joints shall be examined from both sides.

107 The Contractor shall examine the following during the visual checks:
a. Correctness and shape of the weld joint.
b. Incomplete penetration of weld metal.
c. Influx.
d. Burns.
e. Un-welded craters.
f. Undercuts.
g. Cracks in welded parts and heat affected zones.
h. Porosity in weld sandspot welds.
i. Compression in welded joints and a result of electrode while carrying out contact welding.
j. Displacement of welded elements.
The contractor shall document all data as per sound laboratory practices.

108 Mechanical Test:
The Contractor shall carryout various mechanical tests to determine weld-ability, the metal alloy ability, nature of break, correct sizes and type of electrodes, degree of pre-heat and post- heat treatment etc. The type, cope and sample of various mechanical tests shall be determined in agreement with the Engineer. The number of tests conducted shall depend on the result obtained to satisfy the Engineer that the correct type of size of electrode, degree of pre-heating and post- heating and weld-ability of different metal are being followed.

109 Dye Penetrate Examination:
All welds as desired by Engineer will be examined by Dye penetrates for detection of discontinuities as per IS-3658-'81, IS-12889-'89 and RDSO's SPC. No. MRC/NDT/4/91/APPD.

110 Inspection and testing of fabrication:
a) Before fabrication
b) During fabrication
c) After fabrication

110 (a) Before fabrication:
☐ Quality assurance Plan shall be prepared and got approved.
☐ Raw material such as channel and plates etc. to be inspected as per specification mentioned against each items and rolling Mark certificate.
☐ Lamination, piping, pitting, rolling defects and Straightness of material to be checked before fabrication.
☐ Consumables such as, rivets, welding electrodes and paints etc. are as per standard specifications.
☐ Welding procedure Specifications need tobe approved.
☐ Welders approval as per Welding Procedure Specification.

110(b) During fabrication:
☐ Profile of stiffener plate template.
☐ Welding by qualified welders as per approved WPSS.
☐ Welding parameters are to be set & checked during welding.
☐ Riveting by qualified and skilled personnel with approved work instructions.

110 (c) After fabrication:
☐ Verify rolling Mark number of steel sections used for fabrication, from certificate issued by

manufacturer. Check the register maintained by firm.
☐ Surface defects shall be checked visually.
☐ Quality of weld with respect to specified sizes, length and any visual defects.
☐ Quality of rivets to be checked visually and with the help of riveting hammer.
☐ Dye Penetration Test for welds.
☐Leading dimensions i.e, overall length, hole dimensions, end finishing etc. shall be checked. For this purpose, detail measurement sheet shall be prepared.

111 Marking, packing and despatching:
Each piece shall be distinctly marked before delivery in accordance with the approved marking diagram and shall bear such other marks as will facilitate erection. For easy identification at site a small distinguishing mark shall be painted on each and every member before despatch from fabrication shop. The fabricated steel work shall be dispatched by the Contractor in such portions as may be found convenient for erection or as ordered by the BBJ / Railway's Engineer to meet the time schedule.

All projecting plates or bars and all ends of members at joint shall be stiffened, all straight bars and plates shall be bundled, all screwed ends and machined surfaces shall be suitably packed and all rivets, bolts, nuts, washers and small loose parts shall be packed separately in boxes so as to prevent damage or distortion during transit.

112 Template:
Templates need throughout the work shall be of steel packed in such cases as the inspecting Officer may consider necessary.

113 Released U/S small fittings, Bridge Timbers and worn-out-rails (if any) etc. will have to be transported by the contractor to the nearest store depot of PWI/BRI of Railway as instructed by BBJ at his own expenditure.

114 Dip lorries for the transportation of the materials will be supplied by the BBJ / Railway if available as per the convenience and free of hire/charges.

115 Carrying of materials and protection of Dip Lorries by trained staff will have to be done by contractor ensuring safe running of traffic under the supervision of BBJ / Rly's representative.

116 Contractor has to arrange for adequate number of skilled workers and competent supervisors for the execution of this work, their safety during dismantling, transporting and linking of the track over the girders will be the sole responsibility of the contractor.

117 Serviceable materials released from dismantling of the track should be properly accounted and kept in the custody of contractor for re use. Unserviceable materials will be made good by the BBJ / Railway (For rails, F/bolts, Fish plates etc.)

118 Materials supplied free by the BBJ / Railway to the contractor will not form part of the value of the contract entered into and will fail outside the purview of the price variation clause.

119 Adhesion Tests:
Following tests may be conducted to determine the adherence of zinc coating on steel.
(1) Pivoted Hammer Test: The hammer used shall conform to the Para 6.4 of IS:2629-1985. The hammer blow shall be controlled by holding the pivoted base of the handle on a horizontal surface. The test shall consist of two or more standard blows forming parallel impressions with 6 mm spacing and a common axis, as illustrated in Para 6.4 of IS:2629- 1995. No part of an impression shall be closer than 12mm to the edge of the member.

Removal or lifting of the coating in the area between the impressions shall constitute a failure. An

extruded ridge less than 2mm wide immediately adjacent to the impression shall be disregarded. The specimen may be tested in several places throughout its length to the satisfaction of the engineer.

(2) Knife Test: When the coating is cut or pried into, such as with a stout knife applied with a considerable pressure in a manner tending to remove small particles of the coating and it shall not be possible to remove all small particles of the coating and it shall not be possible to peel any portion of the coating so as to expose underlying iron or steel.

120 Contractor has to maintain the following record during execution of the work as part of quality assurance plan Inspection/test certificate for raw material (All sections) by the Original producer of the material. Inspection Register for material used for fabricating various components, should give details of Heat No., Cast No. and relevant test certificate from SAIL/ original manufacturers

Record to be maintained by Fabricator:
1. Jig register
2. Rivet Checking register
3. Material offering & inspection file /register
4. Material test certificate register
5. Welding Procedure data Record.
6. Statement of material test certificates
7. General instructions register
8. Inspection and test report of raw material steel IS-2062/92Gr.b.
9. Material offering and inspection register
10. Rdso/ railway inspection notes compliance register
11. Proforma for list of material offered for inspection
12. Proforma for welding procedure specification sheet
13. Proforma for welding procedure qualification record
14. Radiographic inspection register
15. Register for painting thickness and surface preparation.
16. Measuring equipment testing register
17. Dispatch register giving details of material dispatched span wise:
18. Material handing over register.
19. Plant and machinery register:
20. any other register as required by authorized inspecting agency.

123 Handling & Stacking:
1. Care should be taken for safe transportation.
2. Stacked on properly leveled plate form.
3. Store the channels in safe place away from atmospheric action to avoid scaling, rusting, pitting etc.

121.0 PRICE VARIATION CLAUSE (PVC):
Price variation Clause (PVC) shall be applicable only in tender having advertised value above Rs.2 Crores and having completion period above 12 months. Provide further that, in a contract where PVC is applicable, following shall be outside the preview of price adjustments (i.e shall be excluded from the gross value of the work for the purpose of price variation.

a) Materials supplied by BBJ to the Contractors. either free or at fixed rate;
b) Any extra item(s) included in subsequent variation falling outside the purview of the Bill(s) of Quantities of tender.
(PVC Clause as under or amended up to date of closing of this tender shall be applicable)
Please refer Railway GCC with ACS no. 1to6 Clause 46 (A) under Part-II Standard General Condition of Contract which is applicable for this tender.

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

Clause 46A.6, Part II of GCC shall be read as under:
46A.6 The percentages of various components in various type of works shall be as specified for all item(s)/Bill(s) of Quantities in tender document and the same shall be fixed as per table & classification given below:

SN	Classification Components		1A, 2 & 3A	4A	5A	6A	7	8A	9A	1B,3B,4B,5B , 6B, 8B & 9B	1C,3C,4C,5C , 6C, 8C & 9C	3D, 4D, 5D, 6D, 8D & 9D	3E, 4E, 5E, 6E, 8E & 9E
1	Fixed	*	15	15	15	15	15	15	15	15	15	15	15
2	Labour	L_c	20	25	30	20	50	20	20	0	0	10	25
3	Steel	S_c	0	0	0	0	0	0	0	85	0	50	0
4	Cement	C_c	0	0	15	0	0	0	0	0	85	0	0
5	Plant Machinery & Spares	PM_c	30	15	5	20	15	20	30	0	0	10	30
6	Fuel & Lubricants	F_c	25	15	5	15	15	20	15	0	0	10	20
7	Other Materials	M_c	10	15	30	30	5	25	20	0	0	5	10
8	Detonators & Explosives	E_c	0	15	0	0	0	0	0	0	0	0	0
TOTAL			100	100	100	100	100	100	100	100	100	100	100

*It shall not be considered for any price variation.

The classification mentioned in the table above represents following type of item(s) in the work(s)-
1. Earthwork in Formation
1A All Item(s) excluding 1B or/and 1C
1B Item(s) for supply of Steel
1C Item(s) for supply of Cement
2. Ballast Supply Works
3. Tunnelling Works (Without Explosives)
3A All Item(s) excluding 3B or/and 3C or/and 3D or/and 3E
3B Item(s) for supply of Steel
3C Item(s) for supply of Cement or/and Grout
3D Item(s) for Fabrication & Erection of Structures including supply of Steel
3E Item(s) for Fabrication & Erection of Structures excluding supply of Steel.
4. Tunnelling Works (With Explosives)
4A All Item(s) excluding 4B or/and 4C or/and 4D or/and 4E
4B Item(s) for supply of Steel
4D Item(s) for Fabrication & Erection of Structures including supply of Steel
4E Item(s) for Fabrication & Erection of Structures excluding supply of Steel.
5. Building Works
5A All Item(s) excluding 5B or/and 5C or/and 5D or/and 5E
5B Item(s) for supply of Steel
5C Item(s) for supply of Cement
5D Item(s) for Fabrication & Erection of Structures including supply of Steel
5E Item(s) for Fabrication & Erection of Structures excluding supply of Steel.
6. Bridges & Protection work
6A All Item(s) excluding 6B or/and 6C or/and 6D or/and 6E

6B Item(s) for supply of Steel
6C Item(s) for supply of Cement
6D Item(s) for Fabrication, Assembly, Erection & Launching of Girders including supply of Steel
6E Item(s) for Fabrication, Assembly, Erection & Launching of Girders excluding supply of Steel
7. Permanent Way linking
8. Platform, Passenger Amenities
8A All Item(s) excluding 8B or/and 8C or/and 8D or/and 8E
8B Item(s) for supply of Steel item/fittings
8C Item(s) for supply of Cement Item
8D Item(s) for Fabrication & Erection of Structures including supply of Steel
8E Item(s) for Fabrication & Erection of Structures excluding supply of Steel
9. Any Other Works not covered in Classification 1 to 8
9A All Item(s) excluding 9B or/and 9C or/and 9D or/and 9E
9B Item(s) for supply of Steel
9C Item(s) for supply of Cement or/and Grout
9D Item(s) for Fabrication & Erection of Structures including supply of Steel
9E Item(s) for Fabrication & Erection of Structures excluding supply of Steel
Clause 46A.7 Formulae, Part II of Railway GCC shall be read as under:
46A.7 Formulae: The Amount of variation in prices in various components (labour, material etc) shall be worked out by the following formulae:

(i) $L = \frac{(W \text{ or } W_{SF} \text{ or } W_F \text{ or } W_{SFL} \text{ or } W_{FL}) \times (L_Q - L_B) \times L_C}{L_B \times 100}$

(ii) $M = \frac{(W \text{ or } W_{SF} \text{ or } W_F \text{ or } W_{SFL} \text{ or } W_{FL}) \times (M_Q - M_B) \times M_C}{M_B \times 100}$

(iii) $F = \frac{(W \text{ or } W_{SF} \text{ or } W_F \text{ or } W_{SFL} \text{ or } W_{FL}) \times (F_Q - F_B) \times F_C}{F_B \times 100}$

(iv) $E = \frac{(W) \times (E_Q - E_B) \times E_C}{E_B \times 100}$

(v) $PM = \frac{(W \text{ or } W_{SF} \text{ or } W_F \text{ or } W_{SFL} \text{ or } W_{FL}) \times (PM_Q - PM_B) \times PM_C}{PM_B \times 100}$

(vi) $S = \frac{(W \text{ or } W_S \text{ or } W_{sF}) \times (S_Q - S_B) \times S_C}{S_B \times 100}$

(vii) $C = \frac{(W \text{ or } W_c) \times (C_Q - C_B) \times C_C}{CB \times 100}$

Base Month: The Base Month for 'Price Variation Clause' shall be taken as **May-2024**. The quarter for applicability of PVC shall commence from the month following the Base month. The Price Variation shall be based on the average Price Index of the quarter under consideration

Note-
1.0 In case of any disputes regarding interpretation of any of the above clause, decision of the BBJ shall be final and binding on the Contractor.
2.0 The work will be executed under the supervision of Railway / BBJ.
3.0 Supply of all materials will be as per Railway's approved list
4.0 All types of testing will have to be carried out as per Railway / BBJ instruction.
5.0 This contract is based on Railways tender no. eT-Br-WAT-15-2024 dated 08/05/2024 and all the terms and conditions of Railways tender will be applicable to the agency except the price part.

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

SPECIAL CONDITION OF CONTRACT

1. **DEFINITIONS AND INTERPRETATION**

In this Tender Document, as hereinafter defined, the following words and expressions shall have the meaning as under:

a) "**BBJ**" shall mean The Braithwaite Burn & Jessop Construction Company Limited having its registered office at 27, R. N. Mukherjee Road, Kolkata- 700 001.
b) "**TENDER**" shall mean the proposal submitted by the Tenderer/ Bidder/ Supplier/ Dealer/Agency in response to BBJ's Notice of Invitation to this Tender Document.
c) "**ORDER**" shall mean a written Work/ Purchase Order issued by BBJ.
d) "**TENDERER/ BIDDER**" shall mean the firm or Company (hereinafter called Tenderer/ Bidder) who duly submits the tender after accepting all the terms & conditions of the tender document.
e) "**SUCCESSFUL BIDDER**" whose tender has been finally accepted by BBJ.

2. **ELIGIBILITY CRITERIA**

Supporting documents to be submitted in the Techno-Commercial part of the tender.

a) **Technical Criteria:**

The tenderer must have successfully completed or substantially completed similar works (not less than 80%) during last seven years ending last day of month previous to the one in which applications are invited and should be either of the following:

(i) Successfully completed or substantially completed at least **3 (three)** such similar works each costing not less than **30%** of the advertised value of tender

Or

(ii) Successfully completed or substantially completed at least **2 (two)** such similar works each costing not less than **40%** of the advertised value of tender

Or

(iii) Successfully completed or substantially completed at least **1 (one)** such similar work costing not less than **60%** of the advertised value of the tender

Note:

(i) **"Similar work"** shall mean successful/ substantial execution of "Supplying, fabrication, erection and launching of Heavy Steel Structural items during last 07 (seven) years for any Government / PSU / other Organization."
(ii) Completion certificate(s) of orders or ongoing up to date work done certificate/ Document as per the above criteria to be submitted by the bidder. In addition to above, any civil experience work done along with bridge work will be considered for valuation
(iii) Substantial completion shall be based on 80 (eighty) percent (value wise) or more for the works completed under the contract.

b) The tenderer should have RDSO approved workshop for fabrication of welded plate and truss girders.

c) **Financial Criteria:**

i. Average Annual financial turnover during the last 03 (three) financial years, ending 31st March of the previous financial year **at least 30% of advertised value of the Tender.** However, in case balance sheet of the previous year is yet to audited, the audited balance sheet of fourth previous year shall be considered.
ii. Certificates in the form of Audited Balance Sheet and Profit & Loss account shall be produced by the tenderer(s) to this effect duly certified by the Chartered Accountant.

d) Other documents as mentioned on Para 5(d) of the Instruction to Bidders - Submission of Bid: Techno-Commercial Part is to be submitted.

3. **COMPLETION PERIOD**

The date of commencement shall reckon from the date of Letter of Acceptance (LOA)/ Order and entire work has to be completed in all respects within **15 (fifteen) months** from the date of LOA/ Order, whichever is earlier.

4. **EXTENSION OF COMPLETION PERIOD:**

Application for extension of time of completion will be dealt as per provision of Clause 17A & 17B of GCC of Railway 2022 with ACS no. 1 to 6, under Part-II Standard General Condition of Contract. However, for the sake of continuation of work BBJ may grant provisional extension.

5. **WORKMANSHIP:**

The workmanship for the job shall be closely monitored by the Agency's supervisory staff as per the specification and as directed by the Engineer/ Engineer In-Charge of BBJ/Railway and/or any other authorized agency of Railway. Any work done by the successful bidder is found unsatisfactory or a major mismatch is observed at the site that should be rectified/ redone as per the instructions, immediately after notifying the successful bidder. If the successful bidder fails to do so and the same is done by BBJ then BBJ will also recover the same amount from any due payment of the successful bidder.

Any rejection on grounds of quality shall be re-done at the successful bidder's cost.

6. **QUANTITY OF WORK TO EXECUTE**

The total quantity of work as per Bill of Quantity (BOQ) can vary to any extent as decided by BBJ but the unit rate finalized will not change up to the completion of the project.

7. **RATE**

The bidder must quote the Rate, in percentage above/ below/ at-par, including GST and all other taxes & duties for the items mentioned in BOQ.

Note:

The award of the order or rejection of the Tenderer's offer and/or cancellation of the tender will be made at the absolute discretion of BBJ. BBJ reserves the right to cancel or accept or reject any or all tender(s), whether lowest or otherwise, without assigning any reason(s), whatsoever thereof. A tenderer whose tender is not accepted shall not be entitled to claim any cost, charges, or expenses incidental to or incurred by him through or in connection with the preparation and submission of the Tender/Offer to BBJ. BBJ also reserves the absolute right to split up and award the requirement between two or more Tenderers.

8. **TERMS OF PAYMENT:**

8.1 **MEASUREMENT OF WORK BY CONTRACTOR:**

1. This clause is to be read with clause 45(ii) of Railways GCC with ACS no. 1to 6. Measurement of work by contractor is allowed in works tender having value Rs. 5 crore or more. (ref. RB L. No. 2017/Trans/01/Policy dt. 8/2/18) vide addendum & Correction Slip (ACS) no. 50 to Indian Railway code for engineering dept for introduction of measurement and record of 'Executed works' by contractor in Railway Construction works.
2. For details procedure and instructions please refer Addendum & Correction slip No. 50 to Indian Railways Code for Engineering Department in reference to Clause 1316 A of

Indian Railways Code for Engineering Department.

3. Tax Invoice shall be submitted by the bidder fortnightly on or before the date fixed by BBJ for all works executed in the period of the month. Payment will be released stage-wise based on the fortnightly certified bill based on acceptance of RAILWAY shall apply to the successful bidder.
4. Contractor will submit monthly bill as per the format prescribed by BBJ

Note:

1. Fabrication work shall be done either by RDSO approved vendors for fabrication of bridge girders or from the other vendors by following STR (Schedule Technical Requirements) and QAP (Quality Assurance Plan) approved by CBE, for fabrication works in workshop. The fabrication has to be done in a well-established factory/workshop having guided submerged arc welding facilities. The fabricated girder/column/other structural parts will be transported to site of work by contractor's own means at his own cost. Any decision by BBJ's representative regarding the minimum number of shuttering sets, jigs, plants, machinery etc. in this regard shall be final and binding on the contractor. The contractor shall ensure free/uninterrupted access to fabricator workshop for inspection during execution of work and ensure all arrangements/ facilities for inspection (inspection, transport & stay etc., if required).

8.2 **PAYMENT SCHEDULE:**

A. Payment against R/A and final bill will be released immediately after getting similar payment from Railway.
B. For releasing Final Bill - No Claim Undertaking confirming that the "The Successful bidder" has no claims of any nature against the work order and/or the work done against the work order.
C. Unconditional acceptance of the final bill and measurements entered therein
D. Unconditional Undertaking that The Successful bidder has complied in full with the Legal/ Statutory obligations about the labour engaged by him on the job including payment of terminal benefits if any, and that he indemnifies BBJ of any obligation/ liability that may arise owing to any representation of any workmen employed by him.
E. A Clearance Certificate from BBJ confirming that no job is left as per BOQ/Revised BOQ for the work.

9. **TAXES & DUTIES**

The successful bidder shall be exclusively responsible for payment of all Taxes, Royalties etc. (**including Goods and Service Tax**) that may be levied from time to time according to the Laws & regulations 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 the procurement of materials for execution of the contract.

10. **GOODS AND SERVICE TAX (GST)**

a) The successful bidder shall be liable to pay all applicable taxes [**including Goods and Service Tax (GST)**] or any other tax or cess and show the amount of CGST, SGST, IGST, Cess or any other tax, as applicable, separately in the bill/ invoice/ debit/ credit notes. Successful bidder shall quote their GST Identification No. (GSTIN) in all its bills/invoices/ debit/credit notes.
b) The successful bidder has to provide a proper invoice/ debit/ credit notes bearing QR Code wherever applicable in the form and manner prescribed under rules of the GST Act/ rules containing all the particulars mentioned therein. In the event the successful bidder fails to provide the invoice/debit/credit notes in the form and manner prescribed

under GST, then in the event of such non-compliance of the GST Act/Rules, the successful bidder shall be liable to indemnify for any losses to the Company.

c) The successful bidder shall raise their tax invoice in the regular interval as per contract condition and upload 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 the bidder, the same shall be recovered from Bidder's bill.

d) The successful bidder shall upload/ submit/ report all supply invoices/ debit/ credit notes details in the form of prescribed statements/returns on the GSTN portal on or before the prescribed due dates date as per GST act/rules. The successful bidder shall pay the balance payable GST amount against supplies made to the Company on a monthly basis within due date from the appointed date regularly. Successful bidder shall reconcile the differences/ mismatches in submissions on GSTN portal if any before submission of their final monthly return.

e) The successful bidder shall issue a credit note or debit note (if any) with reference to an original invoice within the prescribed time limit as per GST Act/ rules only after acceptance from the Company and the same shall be uploaded by the successful bidder in the GSTN portal in the same month. Successful bidder shall issue and submit the supplementary invoices (if any) with reference to original invoices to the Company promptly and within the prescribed time limit as per GST act/rules and the same shall be uploaded by the successful bidder in the GSTN portal in the same month. In case there is any loss of credit or additional liability and/ or interest etc. arises due to non-compliance by the successful bidder, the same shall be reimbursed by the successful bidder to the Company. In case the successful bidder disqualifies in any of the above, please note that the input tax credit (GST) shall not be available to the Company and the Company has right to hold the GST amount without any intimation until the matter get resolved and credit is available to the Company.

f) In the event where the input tax credit of the GST charged by the successful bidder is denied by the tax authorities to the Company, the Company shall be entitled to recover such amount from the successful bidder by way of adjustment from the next tax invoice/debit note. In addition to the amount of GST, the Company shall also be entitled to recover from the successful bidder interest along with applicable penalty imposed on the Company under GST laws. It is further agreed that in case the successful bidder fails to charge GST, if applicable, on the services/activities forming part of this agreement, at the time of raising invoices; the Company shall not be liable or responsible for reimbursing such tax, at any later date.

g) The Company reserves the right to change the aforesaid GST/ Tax terms and conditions as notified from time to time by Government of India or respective State Governments. It is further clarified that all payments under this agreement shall be subject to withholding taxes, if applicable.

h) At present GST-TDS is applicable. Deduction of GST-TDS at source would be enforced from the running bills at the rates prescribed. 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.

11. NEW LEVIES/ TAXES

In case Government imposes any new levy/tax or modifies rate of existing taxes including GST after awarding 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 applies to this contract.

12. PERFORMANCE GUARANTEE

a) For due and faithful fulfilment of the contractual obligations, the successful bidder shall furnish a Performance Guarantee for an amount equivalent to **5% (five percent)** of the contract price/ value of work order either by Bank Draft/ NEFT/ RTGS or in the

form of Bank Guarantee. In the event, the Performance Guarantee is submitted in the form of Bank Guarantee the same should be from any Nationalized/ Scheduled Bank of India in the prescribed format of BBJ with due validity period and claim period of 180 days. The aforesaid Bank Guarantee should be submitted within 21 (twenty-one) days from the date of issue of Letter of Acceptance (LOA). BBJ administration reserves the right to cancel the bid and withdraw the LOA if the Performance Guarantee is not submitted within 21 days.

b) Provided further that after receipt of a specific formal request letter (in writing) from the successful bidder with valid justification/ reason for their non-submission of Performance Guarantee within the stipulated period, the said period of 21 (twenty-one) days for submission of Performance Guarantee may be extended at the sole discretion of the Competent Authority of BBJ. In such event of extension, a penal interest of 12% (twelve percent) per annum on Performance Guarantee value shall be charged for the delay beyond 21 (twenty-one) days, i.e., from 22nd day after the date of issue of LOA and up to the actual date of submission. In case the successful bidder fails to submit the Performance Guarantee even within the extended period, as aforesaid, the bid of the successful bidder shall be liable for rejection by the BBJ administration, and the LOA shall stand withdrawn.

c) The Performance 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 successful bidder shall get the validity of Performance Guarantee extended to cover such extended time for completion of work plus 60 days.

d) In case the successful bidder fails to submit the requisite Performance Guarantee within the stipulated period as mentioned in the above paragraphs, the bid may consequentially be cancelled by BBJ, and the LOA shall stand withdrawn. The defaulting successful bidder shall be debarred from participating in Re-Tender for that work and his EMD/ SD/ PG/ RA Bills shall be encashed/ invoked/ forfeited. In this regard, the decision of the Competent Authority of BBJ shall be final.

e) The formal Order shall be issued/ contract agreement (if any) shall be executed within a reasonable time only after receipt of Performance Guarantee from successful bidder. Till such time the order is issued/contract agreement (if any) is executed the successful bidder shall execute the work on the strength of LOA, but no payment shall be made to the successful bidder without order/ contract agreement. In the event the bid is cancelled by BBJ, and LOA is withdrawn accordingly due to non-submission of Performance Guarantee, the successful bidder shall have no right to claim on the executed work if any as aforesaid or any other claim whatsoever.

f) The value of Performance Guarantee originally submitted by the successful bidder need not be changed for a variation of contract price/ order value up to 25% (either increase or decrease). In case during the course of execution, value of the contract increases beyond 25% of the original value, an additional Performance Guarantee amounting to 5% (five percent) as applicable for the excess value over the original contract value shall be deposited by the successful bidder within 21 days from the date of receipt of intimation from BBJ.

g) The Performance Guarantee shall be released after physical completion of the work plus after completion of 60 days thereafter based on 'Completion Certificate' issued by BBJ stating that the successful bidder has completed the work in all respects satisfactorily. The Security Deposit shall, however, be released only after expiry of the maintenance period/ defect liability period and after passing the final bill based on 'No Claim Certificate' from the successful bidder.

h) Whenever the contract is rescinded by BBJ due to failure of the successful bidder, the EMD/ Security Deposit of the successful bidder shall be forfeited, and their Performance Guarantee shall also be encashed. The balance work shall be got done independently without risk & cost of the failed successful bidder. The failed successful bidder shall be debarred from participating in the tender for executing the balance work. If the failed successful bidder is a JV or a Partnership firm, then every member/ partner of such a

firm shall be debarred from participating in the tender for the balance work in his/her individual capacity or as a partner of any other JV/partnership firm.

i) BBJ shall make a claim under the Performance Guarantee for which the BBJ is entitled under the LOA/ Contract (notwithstanding and/or without prejudice to any other provisions in the LOA/ Contract Agreement) in the event of:
   (a) Failure by the successful bidder to extend the validity of the Performance Guarantee as described herein above, in that event BBJ may claim the full amount of the Performance Guarantee from the successful bidder.
   (b) Failure by the successful bidder to pay BBJ any amount due, either as agreed by them or determined under any of the Clauses/ Conditions of the LOA/ Order/ Contract Agreement, within 30 days of the service of notice to this effect by BBJ.
   (c) In the event of the LOA/ Contract being rescinded by BBJ under provisions of any of the clause/ condition of the LOA/ Order/ Contract Agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the BBJ.

13. **SECURITY DEPOSIT:**

As security for the proper and faithful fulfilment of the obligation under the order, a Security Deposit equivalent to **5% (five percent)** of the Total Contract Value shall be deducted and should be kept valid till completion of the entire contract period plus 12 (twelve) months i.e., up to end of Defect Liability Period. Security Deposit shall be in the following manner.

The Earnest Money deposited by the bidder along with the tender will be retained by the BBJ as part of the Security Deposit. The balance amount to make up with the total amount of the Security Deposit may be deposited by the Successful bidder in the form of a Demand Draft/ Pay Order or may be recovered by percentage deduction from the contractor's bills.

Recovery of Security Deposit: The Security Deposit/ rate of recovery/ mode of recovery shall be as under:

a) Security Deposit for work should be **5% (five percent)** of the Contract value and shall be recovered from the R/A bill.
b) The rate of recovery should be at the rate of **10% (ten percent)** of the gross R/A bill amount till the full security deposit is recovered.
c) Security deposits will be recovered only from the bills of the contractor and no other mode of collecting SD such as SD in the form of instruments like BG etc., shall be accepted towards security Deposit.

Security Deposit shall be returned to the contractor after successful completion of entire Order plus 12 (twelve) months i.e., after the end of Defect Liability Period and after the following:

a. After passing the final bill based on the "No Claim Certificate" with the approval of the Competent Authority.
b. Submission of an unconditional & unequivocal 'No Claim Certificate' from the concerned contractor. This certificate, inter alia, should mention that the work has been completed in all respects and that all the contractual obligations have been fulfilled by the contractor and that there is no due from the contractor to BBJ against the contract concerned.

14. **QUANTITY VARIATION**

a) There may be quantity variation as approved by BBJ/Railway during the actual execution of work.

b) The accepted variation in the quantity of each individual location and item of the contract would be up to **30%** (thirty percent) of the quantity originally contracted.
c) The Contractor shall be bound to carry out the work at the agreed rates and shall not be entitled to any claim or any compensation whatsoever up to the limit of 30% variation in the quantity of the individual item of works.

15. **SUPERVISION & LABOUR:**
The bidder will be responsible for providing labour of adequate skill and supervisory staff for the timely execution of work.

16. **WATCH & WARD**
The successful bidder is responsible for the watch and ward of the materials. The price quoted by the Successful bidder is inclusive of the watch and ward expenses and no extra claim will be entertained for the deployment of watch and ward or loss, damage of machinery/ materials at the workshop. BBJ shall not be liable for the loss or damage of any of the successful bidder's equipment, machinery and temporary works.

17. **EMPLOYEES COMPENSATION INSURANCE**
The successful bidder shall submit proof of Employees Compensation Policy for all their workmen/ supervisors and any other person whom the successful bidder will deploy for our Project work before the commencement of the work.

Workmen's Compensation and Employer's Liability Insurance: WC Policy/ Insurance shall be affected for all the employees of the successful bidder. If any of the work is sublet, the successful bidder shall require their Sub-Contractor to provide workmen's compensation and employee's liability insurance for the latter's employees, if such employees are not covered under the Sub-Contractor's Insurance.

18. **PROVIDENT FUND**
The successful bidder will be required to cover all their workmen engaged by them under provident fund (P.F.) from the commencement of the work. The successful bidder will have to submit the challan of payment made towards P.F. for their labour and staff to BBJ's Accounts department every month failing which no RA bill payment will be made.

19. **STATUTORY COMPLIANCE**
The successful bidder shall ensure strict compliance with all relevant labour laws, Minimum Wages Act, Payment of Wages Act, Industrial Disputes Act, Payment of Bonus Act, Contract Labour (Abolition & Regulation) Act, E.S.I. Act, P.F. Acts, Industrial Safety regulations, laws pertaining to use/ storage of explosives for the work. The successful bidder shall submit to BBJ the required documents as proof. Labour Codes (as per the status of their applicability) shall be entered.

20. **CONFIDENTIALITY OF DOCUMENTS**
The successful bidder shall treat all documents, specifications, drawings and contents therein as private and confidential.

21. **SUBLETTING OF WORK**
No part of Work Order nor any share or interest thereof shall in any manner of degree be transferred, assigned, or sublet by the Successful bidder directly or indirectly to any firm or corporation whatsoever without the prior consent in writing of BBJ.

22. **INSPECTION OF WORKS**
Inspection & testing of work executed by the sub-contractor will be done by BBJ and/or Railway and/or their authorised representative and the sub-contractor is required to get the work passed through BBJ and/or Railway and/or their authorised representative.

23. SAFETY AND ENVIRONMENT AT SITE/SHOP

a) The successful bidder shall strictly abide by all safety standards, specifications, practices, rules, and regulations in construction and also the instruction of our safety (EHS) Engineer. Any kind of unsafe action or unsafe method of work by The Successful bidder's workmen, which may lead to injury to the successful bidder's workmen, will be viewed seriously and a penalty for the same will be levied on the successful bidder for such unsafe actions.
b) The successful bidder will be responsible for the safety of their staff and employees of other agencies working in the successful bidder's area of operation.
c) The Successful bidder shall delegate the responsibility of implementation of safety rules to one of The Successful bidder's staff.
d) All safety appliances required like safety helmets, safety belts, shoes, retro-reflective jackets and other Safety PPE, etc., shall be arranged by the successful bidder at The Successful bidder's cost.
e) In the event of non-availability of such safety gadgets at the required point of time, we may, at the sole discretion of the Site in charge, procure such gadgets and issue the same to The Successful bidder on a chargeable basis on actual plus 20% overhead charges.
f) The successful bidder's authorized representative shall attend all safety meetings convened by the site safety (EHS) Engineer and abide by his instructions and follow the site safety practices without failure.
g) Night working: Utmost care shall be taken during night operations with proper illuminations and safety.
h) Any other safety arrangement is recommended to be followed as per instruction of Railway.
i) Further, the successful bidder should ensure compliance with COVID-19 protocols as applicable.

24. LIQUIDATED DAMAGES

The time for the execution of the work shall be deemed to be the essence of the contract and the works must be completed not later than the date(s) as specified in the contract.

If the contractor fails to complete the works within the time as specified in the contract for the reasons not attributable to the successful bidder, BBJ may, if satisfied, allow the contractor to complete the work for further extension of time without imposing LD.

If the successful bidder fails to complete the works within the time as specified in the contract for the reasons attributable to the successful bidder, BBJ allows, if satisfied that the works can be completed within a reasonable short time thereafter, the successful bidder for further extension of time. On such extension, BBJ will recover from the bills of the successful bidder, as agreed damages, a sum equivalent to ½ (half) of 1% of the contract value per week or part of the week of any supplied equipment/services not delivered within stipulated time period or total order value in the case where part delivery is of no use to the purchaser, subject to the maximum limit of 10% for contract value up to 2 (two) lakh and 5% for contract value above 2 (two) lakh.

For the purpose of this Clause, the contract value of the works shall be taken as the value of work as per contract agreement including any supplementary work order/contract agreement issued.

Provided further, that if BBJ is not satisfied that the works can be completed by the Successful bidder and in the event of failure on the part of the successful bidder to complete the work within the further extension of time allowed as aforesaid, BBJ shall be entitled to

encash the successful bidder's Security Deposit and Performance Guarantee and also rescind the contract, whether or not actual damage is caused by such default.

25. **INDEMNITY**

Bidder shall indemnify BBJ against all claims in respect of their contractual obligations in the event of non-compliance of statutory rules/ obligations/ laws/ taxes & duties etc.

26. **TERMINATION OF CONTRACT**

In the event, BBJ finds that the successful Bidder's progress is consistently below the accepted pace based on the program scheduled mentioned in this document or fixed by BBJ and/or if the quality of works being executed by the successful Bidder falls below the expected standards laid down by BBJ, in such cases, in the interest of timely and successful completion of the project and to maintain the high quality of work, BBJ reserve the right to delete the Scope of Work of the successful Bidder, or, the entire balance work to be taken away from the successful Bidder and BBJ shall be at liberty to get such works done/executed by any other agency/ agencies. Moreover, BBJ shall not be liable to pay any compensation or make good any damage/s or to affect any other payment to the present successful bidder for any ground whatsoever.

In the above event, the successful bidder shall be debarred from participating in the tender for executing the balance work. If the successful bidder is a JV or a Partnership firm, then every member/partner of such a firm shall be debarred from participating in the tender for the balance work in his/her individual capacity or as a partner of any other JV /partnership firm.

The defaulting successful bidder shall not be issued any completion certificate for the contract.

All the statuary obligations including maintaining all other relevant Statues, Laws/ Rules, Local Rules & Regulations/ Rules of Central/ Local Govt. bodies should abide & comply by the successful Bidder and any consequence comes out from the act or omission of the successful Bidder which can result in stoppage of work or the successful bidder fails to comply any of its respective Contractual obligation(s) within the stipulated time frame, in that event BBJ reserves the right to terminate the contract and to take any action against the successful Bidder (such as forfeiture of EMD/ Security Deposit, encashment of Performance Bank Guarantee, non-payment/ forfeiture of RA Bills etc.) and the decision of BBJ in this respect shall be final.

In the above situations, BBJ reserves the right to issue a notice in writing to that effect and if the successful bidder does not within seven days after the delivery to him of such notice proceed to make good his default in so far as the same is capable of being made good and carry on the work or comply with such directions as aforesaid of the entire satisfaction of the BBJ, then BBJ shall be entitled after giving 48 hours' notice in writing to rescind the contract as a whole or in part or parts (as may be specified in such notice) and after the expiry of 48 hours' notice, a final termination notice should be issued by BBJ.

27. **RESOLUTION OF DISPUTES AND ARBITRATION**

In case a dispute or difference of any kind whatsoever arises out of or relates to the Contract or ancillary/incidental as to the terms and conditions of it or relates to any matter for execution and/or performance of the contract, between the parties to the Contract, it is a term of the agreement by and between the parties herein that before invoking arbitration, the aggrieved party shall first & foremost refer the matter to the Competent Authority of BBJ and the decision/recommendation/interpretation made by the said Competent Authority of BBJ shall be final & binding upon both the parties.

On the failure of the procedure prescribed above or if a party is dissatisfied with the decisions/recommendations aforesaid, and notwithstanding anything else contained elsewhere, the aggrieved party may by notice in writing to the Competent Authority of BBJ evince the intention to refer the disputes and differences that have arisen between the parties to Arbitration by the constitution of an Arbitral Tribunal. The Arbitral Tribunal shall consist of three arbitrators, one each to be nominated by the respective parties and the third to be appointed by the nominated arbitrators.

Pending submission of and/or decision on a dispute or difference as aforesaid or until the Arbitral Award is published, the parties (if the Contract is not terminated/ cancelled) shall continue to perform all of their obligations under this Agreement and the Contract, without prejudice to a final adjustment in accordance with such award.

The decision of the Arbitral Tribunal arrived at after hearing the parties shall be final and binding upon the parties. The Arbitration Proceedings shall be conducted in accordance with the Arbitration and Conciliation Act, 1996 or any statutory modifications or re-enactments thereof.

It is also agreed by the parties that the Arbitration Proceedings shall be conducted in the English language. The venue of Arbitration shall be Kolkata only and any proceedings arising out of this Agreement / Contract shall be subject to the jurisdiction of Courts at Kolkata.

65.6 While executing the work by the agency and/or after completion of the work and/ or till completion of the maintenance period as per order, a dispute or difference of any kind whatsoever arises out of or relates due to actions of the Railway and/ or the agency, the same will at first instance be settled amicably with the Railway through BBJ. In case amicable settlement cannot be reached and it is required to initiate arbitration proceeding by BBJ with the Railway, the agency will bear entire costs related to arbitration proceedings including legal expenses, incidental costs e.g. costs related to travelling, food & lodging of BBJ's representatives including BBJ's legal experts/ lawyers, costs of documentation etc.

28. **FORCE MAJEURE:**

If any time, during the continuance of this contract, the performance in whole or in part by either party under obligation as per this contract is prevented or delayed by reasons of any war or hostility, the act of the public enemy, civil commotion, sabotage, fire, flood, explosion, epidemic, quarantine restrictions, strike, lockout or acts of God (hereinafter referred to as "eventuality"), provided notice of happening of any such eventuality is given by either party to the other within 21 (Twenty) days of the date of occurrence thereof, neither party shall because of such an "eventuality" be entitled to terminate this contract nor shall either party have any claim or damages against the other in respect of such non-performance or delay in performance and deliveries under the contract. The contract shall be resumed as soon as practicable after such "eventuality" has come to an end or ceased to exist.

In case of any dispute, the decision of BBJ shall be final and conclusive, provided further that if the performance in whole or part of any obligation under this contract is prevented or delayed because of any such eventuality for a period exceeding 60 (Sixty) days, either party may at its options, terminate the contract.

Provided that if the contract is terminated under this clause, the Purchaser shall be at liberty to take over from the supplier at a price to be fixed by the purchaser, which shall be final, all unused, undamaged and acceptable equipment, bought out components and other stores in the course of manufacture which may be in the possession of the Supplier at the time of such termination, or such portion thereof as BBJ may deem fit except such equipment, as the Supplier may, with the concurrence of the Purchaser, elect to retain.

29. **NON-SCHEDULE ITEM OF WORK**

Settlement of rate of the extra item(s) of work which is/are not covered by the schedule:

The successful bidder shall notify any extra item(s) of work to BBJ immediately after he comes across the same during the execution of work and submits the rate for the same. Based on merit, BBJ shall take up with RAILWAY for settlement of the rate of the extra item(s) of work. If RAILWAY admits the said extra item(s) of work and settles the rate thereof then BBJ shall also admit the said extra item of work for the successful bidder and pass on 90% of the rate settled by RAILWAY.

30. **IMPORTANT NOTES:**

BBJ reserves the right to:

i) Accept or reject any bid received at its discretion without assigning any reasons whatsoever.
ii) Increase/ decrease/ alter the job description/ scope of work with the corresponding change in the value of the contract.
iii) Postpone or extend the above-mentioned date, split and distribute the work among more than one bidder without assigning any reason whatsoever.
iv) May ask for further qualification during techno commercial scrutiny of bids received.
v) BBJ shall not be liable for any expenses incurred by the bidder for delivery of materials or during the preparation of the bid irrespective of whether it is accepted or not.
vi) Canvassing i.e., soliciting favour, seeking advantage etc. in any form is strictly prohibited and any bidder found to have engaged in canvassing shall be liable to have his bid rejected summarily.
vii) If the bidder deliberately gives any wrong information in his tender to create circumstances for the acceptance to his bid, BBJ reserves the right to reject such application.

(पार्थ नंदी / PARTHA NANDY)
मुख्य प्रबंधक (परियोजना) / CHIEF MANAGER (PROJECT)

दी ब्रेथवेट बर्न एंड जेसप कंस्ट्रक्शन कंपनी लिमिटेड
The Braithwaite Burn And Jessop Construction Company Limited
(भारत सरकार का एक उद्यम) / (A Government of India Enterprise)

NIT No. eNIT/BBJ/RE-GIRDER/WALTAIR/14-2024 Date: October 24, 2024

Annexure-A

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER
(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

_____
(Write Name and Designation of Officer of BBJ inviting the Tender)
The Braithwait Burn And Jessop Construction Co. Ltd.
(A Government of India Enterprise)
27, Rajendra Nath Mukherjee Road,
Kolkata – 700001

Dear Sir,

Sub: **Declaration by Authorised Signatory regarding Authenticity of submitted documents.**
Ref: 1) NIT/Tender Enquiry No. & Date: …….
2) All other pertinent issues till date

I/We, hereby certify that all the documents submitted by us in support of possession of "Qualifying Requirements" are true copies of the original and are fully compliant required for qualifying / applying in the bid and shall produce the original of same as and when required by The Braithwaite Burn And Jessop Construction Co. Ltd.

I / We hereby further confirm that no tampering is done with documents submitted in support of our qualification as bidder. I / We understand that at any stage (during bidding process or while executing the awarded works) if it is found that fake / false / forged bid qualifying / supporting documents / certificates were submitted, it would lead to summarily rejection of our bid / termination of contract. BBJ shall be at liberty to initiate other appropriate actions as per the terms of the Bid / Contract and other extant policies of The Braithwaite Burn And Jessop Construction Co. Ltd.

Yours faithfully,

(Signature, Date & Seal of Authorized Signatory of the Bidder)
Date: