RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW-226011

Document No. : **BS-S-7.5.3.1-4**
Document Title: **SCHEDULE OF TECHNICAL REQUIREMENTS (STR) FOR FABRICATION OF STEEL GIRDERS (PART-A & B)**

AMENDMENT HISTORY:

Schedule of Technical Requirements (STR) for Fabrication of Open Web, Composite and other Steel Girders (Part-A)				**Schedule of Technical Requirements (STR) for Fabrication of Composite and other Steel Plate Girders (Part-B)**		
S. No.	Amendment Date	Version	Reasons for Amendments	Amendment Date	Version	Reasons for Amendments
1.	25-01-2018	1.0	Complete revision of STR as approved by Railway Board. It will be effective from 01.02.2019.	14-09-2010	1.0	STR approved by Railway Board
2.	15-12-2018	1.1	Minor Modification in Para 4.2 & 5.2.	22-06-2012	1.1	Minor Change in procedure for ONLINE Facility only (Facility of Hard Copy withdrawn)
3.	21-02-2019	2.0	Change in cut-off date, after approval of Railway Board. It will be effective from 01.12.2019.	23-10-2012	2.0	Modification in Para 2.2,2.4,2.5,4.3, & 7.8 and addition of Para 4.41 & 4.15
4.	12-07-2022	3.0	Major change in Para 4.3.	27-06-2024	3.0	Modification in Para 2.2.1,2.2.2,4.1 to 4.12, 6.2,7.1,7.4,7.5 & 7.8, deletion of Para 2.2.2 to 2.6 and addition of Para 4.16
5.	-	-	-	21-09-2015	3.1	Minor Modification in Para 2.2 &2.2.1
6.	-	-	-	25-01-2018	4.0	Complete revision of STR as approved by Railway Board. It will be effective from 01.02.2019
7.	-	-	-	15-12-2018	4.1	Minor Modification in Para 4.2 & 5.2
8.	-	-	-	21-02-2019	4.2	Change in cut-off date, after approval of Railway Board. It will be effective from 01.12.2019
9.	-	-	-	28-06-2021	4.3	Modification in Para 5.8
SCHEDULE OF TECHNICAL REQUIREMENTS (STR) FOR FABRICATION OF OPEN WEB, BOW STRING, CAMEL-BACK TYPE TRUSS, COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-A) AND FABRICATION OF COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-B)						
10.	06-08-2025	5.0	Major changes in Para 1.0, 4.3, 5.14b, 5.18, 5.19, 6.4, 6.5, 6.6, 6.7, 6.8, 7.2, 8.0 & 8.1 and merger of STR of Part-B with Part-A for simplicity and uniformity. This STR will be effective from 06/04/2026.			

SCHEDULE OF TECHNICAL REQUIREMENTS (STR) FOR FABRICATION OF OPEN WEB, BOW STRING, CAMEL-BACK TYPE TRUSS, COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-A) AND FABRICATION OF COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-B)

1.0 Scope

This schedule covers the norms for evaluation of the capability and the capacity of any firm for fabrication & supply of Open Web, Bow string, Camel-back type truss, Composite & other Steel Plate Girders (Part-A) and fabrication & supply of Composite & other Steel Plate Girders (Part-B). Intended fabricators will be required to fabricate riveted/bolted/welded plate girders and open web girders & Bow string girders and Camel-back type truss girders if approved for Part-A and riveted/bolted/welded Composite & other Steel Plate Girders if approved for part-B.

2.0 Requirement for registration of firms for fabrication of girders

2.1 The firm will ensure availability of the following for registration as fabricator of girders-

i) The required Infrastructure, Machinery & Plants.

ii) Testing and measuring Equipments duly calibrated.

iii) Trained technical manpower and Quality Assurance Programme (QAP).

iv) Equipments meeting the requirements of relevant specifications.

v) Space required for manufacturing/ fabrication, testing and storage viz. Manufacturing/fabrication shop, godown, store, office and testing laboratory etc.

2.2 If manufacturer/fabricator is satisfied that its infrastructure and other facilities are commensurate with the infrastructural and other requirements as listed above and at other places of this document, then firm shall apply for registration online through U-VAM on IREPS portal (https://www.ireps.gov.in) alongwith all relevant supporting documents regarding compliance of STR and undertakings in support of self compliance of this STR as well as RDSO's vendor registration guidelines. RDSO's vender registration guidelines as ISO Apex documents and Directorates documents are available at RDSO's website (https://www.rdso.indianrailways.gov.in). The requisite charges are specified on the website could be deposited through the means as specified on the IREPS Portal.

3.0 Norms for Acceptance

To qualify for riveted/welded/bolted steel bridge girders production, the firm must satisfy the requirement as laid down in Para 4 to 6 as under.

4.0 **General and Infrastructural Requirements:-** Detailed Information on items given below shall be furnished submitting necessary documents in support as applicable:-

4.1 The fabricator must have proper organisation including supervisors, skilled workers and adequate manpower to execute the fabrication work in competent manner. Necessary supporting documents (list of staff alongwith qualification & experience) shall be submitted along with application of registration.

4.2 Various raw materials and consumables etc. required for fabricating steel girders must be purchased by fabricators and a proper organisation must exist to perform the functions of purchasing

of various raw materials and consumables etc. and maintaining related inspection certificates, test certificates etc. Necessary supporting documents (list of staff alongwith qualification & experience) shall be submitted along with application of registration.

4.3 **Qualifying Criteria:** Fabricator must have previous experience of fabricating steel structures (in the proposed fabrication workshop/ manufacturing facility) such as bridge girders, heavy industrial steel structures etc. as under:

Part-A

(a) Firm must have fabricated minimum 1 Span of Open Web Girder of Railway Bridges of not less than 30.5m.

OR

(b) Firm must have fabricated minimum 1 Span of Bow String Girder/ Camel-back type truss Girder for Railway not less than 30.0m.

Part-A (temporary for two years)

(c) Firm must have fabricated minimum 3 Spans of Plate Girders/ Composite girders of Railway Bridges or ROB not less than 9.15m and total weight not less than 300MT.

Part-B

(d) Firm must have fabricated minimum 1000 MT Railway Foot Over bridges, Platform shelters and Bridge Girder pathways etc.

OR

(e) Firm must have fabricated minimum 1000 MT heavy Industrial Structures involving built-up I-Girders of depth not less than 700mm or Box section with X-sectional area of Box not less than 90000mm^2.

Note:-(i) Previous experience will be considered only for the works completed successfully during the last five financial years & up to the date of application in the current financial year.

(ii) The applicant has to submit the concerned fabrication details along with performance certificate from client, explicitly as supporting documents and in absence of documents, experience will not be considered. Certificate issued by Government Organization/Semi-Government Organization/Public Sector Undertakings (PSUs) will be accepted for this purpose.

(iii) Performance certificate from Private firms can also be accepted provided the average annual turnover for last three financial years of private firm is not less than Rs.100 Crore. In support of this the applicant has to submit necessary certificates and Audited Balance Sheets of Chartered Accountant or Income tax returns.

(iv) In case of (c) only temporary approval in Part-A for two years shall be given to firms which have fabricated not less 300MT Plate Girders or Composite Girders or both during last three financial years and passed as per approved QAP by RDSO/Railway's Fabrication Inspection Unit (FIU) /authorised Third Party Inspection (TPI) Agencies as applicable subject to fulfilling other requirements in case of Railway works and performance certificate from Government Organization/Semi Government Organization/PSU/Private firms(as specified in note (ii) and note (iii) above in case of works other than Railways.

(v) Regular approval will only be given after completion of fabrication of minimum one span of Open Web Girder of Railway Bridges of not less than 30.5m or Bow string/ Camel-back type truss Girder for Railway of not less than 30.0m & passing as per approved QAP by RDSO/Railway's Fabrication Inspection Unit (FIU) /authorised Third Party Inspection (TPI) Agencies as applicable in the initial registration period of 2 years temporary approval for Part-A.

In case firm is not able to get any order for Open Web Girder or Bow string/ Camel-back type truss Girder for Railway during this period, regular approval will only be given after completion of fabrication of minimum one span of Open Web Girder of Railway Bridges not less than 30.5m/ Bow string/ Camel-back type truss Girder for Railway not less than 30.0m at its own cost & passing as per approved QAP by RDSO/ Railway's Fabrication Inspection Unit (FIU) /authorised Third Party Inspection (TPI) Agencies as applicable in the initial registration period of 2 years temporary approval for Part-A.

(vi) In case of (d) & (e), the approval will only be given for Part-B and status will be upgraded to Part-A (temporary approval for two years) subject to additional compliance of note (iv) above and upgradation from temporary approval in part-A to regular approval in Part-A after further compliance of stipulations of note (v) above.

(vii) Firm has to submit compliance for regular approval immediately after completion of two years of temporary approval. In absence of successful compliance firm will be placed in Part-B, subject to compliance of other requirements as per STR.

4.4 A proper procedure for maintaining records for receipt and consumption of raw material should be in vogue or developed so as to permit verification by Railway's representative.

4.5 Adequate power supply should be available through power distribution agencies. In addition to above adequate power backup shall be available through captive generation. Necessary supporting documents shall be submitted along with application of registration.

4.6 Covered bay/shed area duly protected from rains/wind and dust for fabrication should be available. Necessary supporting documents shall be submitted along with application of registration.

4.7 Enough area to store raw materials, sub-assemblies and finished products should be available. Necessary supporting documents shall be submitted along with application of registration.

4.8 A separate line/space for inspection and testing of girders by Railway's inspecting engineers should be available. Necessary supporting documents shall be submitted along with application of registration.

4.9 Covered shed area protected from rain/wind, dust etc. should be available for surface preparation/ metalizing/ painting of steel girders. As no part of the fabricated items shall be painted unless it has been finally passed and cleared by inspecting officials, adequate space for storing fabricated component awaiting painting shall be available. Necessary supporting documents shall be submitted along with application of registration.

4.10 For full scale layout of drawings to which girders are to be manufactured, template shop with level 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. Necessary supporting documents shall be submitted along with application of registration.

4.11 Sufficient space for trial erection of the girder after manufacturing/fabrication shall be available. For this purpose, proper handling equipment, stacking space and other facilities shall be available and same should be marked clearly on the factory plan to be submitted along with application of registration. Necessary supporting documents shall be submitted along with application of registration.

4.12 An adequately equipped and staffed drawing office is required for preparation of fabrication drawings. Fabricator must have facility to create 2-D fabrication drawings from 3-D models of bridge girders developed using structural drawings of girders. List of staff along with Qualification & experience and details of softwares being/ to be used for modelling of bridges & further converting into 2-D fabrication drawings shall be submitted along with application of registration.

Note: For the above Paras, applicant has to submit neat copies of plans of works premises & details of items.

5.0 Machinery & Plants:

Following machinery and plants shall be available with the fabricator. Necessary supporting documents providing details like make, model, capacity, quantity, serial number and year of manufacture & commissioning etc. shall be submitted along with application of registration.

5.1 Computer Numerical Control (CNC) Cutting Machine (Gas/Plasma) or CNC Cutting Cum Drilling Machine.

5.2 CNC/Automatic Beam Welding Machine.

5.3 CNC Plate Drilling Machine or CNC Cutting Cum Drilling Machine.

5.4 Facilities for surface preparation through Shot Blasting Machine/Grit Blasting Machine as per IRS B1 Specification.

5.5 EOT/Portal/Mobile Crane of minimum 20T capacity for handling of materials for fabrication of girders, unloading of raw materials and loading of finished products etc.

5.6 Compressors of adequate capacity suitable for riveting/bolting and other applications.

5.7 Radial drilling machines of adequate capacity to drill holes up to 50mm diameter.

5.8 End milling machine.

5.9 Plate, rolled sections and built-up sections straightening machines.

5.10 Minimum three number of each portable pneumatic tools such as grinders, drilling machines, chipping machines, wrenches, elcometer, surface roughness tester, calibrated steel measuring tapes, etc.

5.11 Minimum one number Dumpy level/Theodolite/Total Station for recording of camber/deflection of trial assembled girder etc.

5.12 Facilities for metalizing and painting as per IRS B-1 specification.

5.13 **Testing facilities for testing of mechanical properties, chemical composition, microstructure etc**: These facilities can be in-house or may be arranged from outside.

Note:

(i) If facilities are in-house, details of equipment like its make, model number, year of manufacture/commissioning, calibration certificate and copy of test certificates issued earlier etc. shall be submitted along with application of registration.

(ii) In case in-house facility is not available then testing can also be got done from outside agencies provided the testing facility is NABL/NABCB accredited. A Memorandum of Understanding (MOU) to that effect should be submitted. The validity of MOU shall be minimum 65 months at the time of application.

5.14 **Testing facilities for Ultrasonic Flaw Detection**: Ultrasonic Flaw Detection facilities can be in-house or may be arranged from outside.

Note:

(i) If facilities are in house details of equipment like its make, model number, year of manufacture/commissioning, calibration certificate and copy of some test certificates issued earlier shall be submitted along with application of registration. The Operator conducting the testing must possess a valid proficiency certificate of level-II (minimum).

(ii) In case in-house facility is not available then testing can also be got done from outside agencies- The testing will be done only by the authorised operator having proficiency certificate of level-II (minimum).A Memorandum of Understanding (MOU) to that effect shall be submitted. The validity of MOU shall be minimum 65 months at the time of application.

5.14 (a) In-house Macro Etching and Dye-Penetration testing facilities.

(b) Testing facilities for Butt weld joints- Phased Array Ultrasonic Testing (PAUT) either in house or from external agency.

Note-

(i) **If PAUT** facilities are in house- details of equipment like its make, model number, year of manufacture/commissioning, calibration certificate and copy of some test certificates issued earlier shall be submitted along with application of registration. The Operator conducting the testing must possess a valid proficiency certificate of level-II (minimum) for conducting PAUT. In case in-house facility is not available then testing can also be got done from outside agencies provided the authorised operator is having proficiency certificate of level-II (minimum) for conducting PAUT. A Memorandum of Understanding (MOU) to that effect shall be submitted. The validity of MOU shall be minimum 65 months at the time of application.

(ii) If testing is being done through Radiographic testing (RT) by existing vendors; the same may continue till the validity of existing MOU and shall be phased out and replaced with PAUT.

5.15 System of periodical maintenance of M&P must be in vogue and proper records shall be maintained.

5.16 The following facilities shall also be available for fabrication of welded girders. The details of equipment like its make, model number, year of manufacture/commissioning, calibration certificate and copy of some test certificates issued earlier shall be submitted along with application of registration.

(a) Welding Transformers/Rectifiers for Manual Metal Arc Welding (MMAW).

(b) MIG/CO_2 Welding Equipment sets.

(c) Single headed or Multi headed Automatic/ Semi-Automatic Submerged Arc Welding (SAW) Machine/Equipment.

(d) Suitable Welding Manipulators.

(e) Stud Welding Machine in-house.

(f) Tongue testers or clamp meters for measuring current and voltage.

(g) Gauges for checking weld size, throat thickness and edge preparation etc.

5.17 Fabricators must ensure that welding and gas cutting equipment/accessories meet BIS or other international standard requirements. It will be fabricator's responsibility to satisfy the inspecting engineer that all the welding equipment/accessories conform to the BIS standard or any other international standards in the absence of proper marking on such equipments/accessories.

5.18 Only trained and qualified Welders shall be deployed for welding. The welder must be trained in accordance with the provisions of IS: 817. The welders engaged should be at least high school pass and preferably trained from ITI or reputed welding training institutes. They must have also attended-Special course on Welding Technology for Welders (Course No- SSTC/RDSO/2W) conducted by Welding Research Institute (WRI), Tiruchirappalli. The welders must be tested as per requirements of IS: 7310 and proper records shall be maintained. Fabricators to submit copy of Welder's qualification, training certificate and Welding Procedure followed at their works alongwith the application of registration.

5.19 All welding shall be carried out under the overall supervision of qualified welding supervisors trained in welding technology from any government approved welding institute. They must have also attended Special course on Welding & Inspection for welding supervisors (Course No.- SSTC/RDSO/1E) run by Welding Research Institute (WRI), Tiruchirappalli. Details of staff, their qualification, training certificate and experience shall be submitted by Fabricators alongwith the application of registration. Welding supervisors may either be in-house or outsourced. If outsourced, an MOU also to be submitted alongwith application at time of registration. The validity of MOU shall be minimum 65 months at the time of application.

5.20 Welding instructions shall be prominently displayed on the shop floor.

Note: (i) Machinery & Plants owned by sister concern will not be accepted.

(ii) During the inspection by RDSO officials, if any machinery is found deficient from the requirement, the firm will be delisted/ temporary delisted as per procedure prescribed in related ISO Document of RDSO.

6.0 Quality Infrastructure:

6.1 Fabricator shall have proper infrastructure to ensure the quality product as per requirement of latest issue of IRS-B1 Specification and IRS-Welded Bridge Code as applicable.

6.2 A system should be in force for analysis of defects noticed during internal and external inspections of the final products and sub-assemblies. A dynamic arrangement for feedback to the source of defects and for rectification should be in vogue. Proforma being followed shall be submitted alongwith the application of registration.

6.3 Following Specifications/Codes (latest version) commonly referred in connection with fabrication of steel girders must be available with fabricator:

IRS: B1	Specification for fabrication and erection of steel Girder Bridges and locomotive Turn Tables.
IRS:SBC	Steel Bridge Code
IRS:WBC	Welding Bridge Code
BS-111	RDSO Guidelines for use of High Strength Friction Grip (HSFG)

	bolts on bridges on Indian Railways.
IS: 1148	Steel rivet bars (medium & high tensile) for structural purposes.
IS: 1149	Specification for High tensile steel rivet bars for structural purposes.
IS: 1852	Specification for Rolling and cutting tolerances for Hot Rolled Steel Products.
IS: 2062	Hot rolled medium and high tensile structural steel Specification
IS: 817	Code of practice for training and testing of metal are welders
IS: 818	Code of Practice for Safety and health requirements in electric and gas welding and cutting operations
IS: 822	Code of Procedure for inspection of welds
IS: 4353	Submerged arc welding of mild steel and low alloy steels recommendations
IS: 7307(Pt-1)	Approval tests for welding procedures-fusion welding of steel
IS: 7310(Pt-1)	Approval tests for welders working to approved welding procedures-fusion welding of steel
IS: 9595	Metal-arc welding of carbon and carbon manganese steels recommendation.
IS: 3935	Code of practice for composite construction
IS: 3757	Specification for high strength structural bolts
IS: 4000	Code of practice for high strength bolts in steel structures
IS: 6623	High Strength Structural Nuts-Specifications
IS: 6649	Hardened and Tempered Washers for High Strength Structural Bolts and Nuts
BS: 5400-6	Steel, concrete and composite bridges, Specification for materials and workmanship, steel
BS/EN/ISO: 13918	Welding-Studs and ceramic ferrules for arc stud welding
ISO: 8692	Code of mechanical properties of Stud Shear Connector

6.4 **Quality Assurance Aspect**: System for testing of raw material to ensure that it conforms to relevant specification should exist. The traceability of material should be there.

6.5 All equipment must meet the requirements of relevant BIS or other international specifications. It will be fabricator's responsibility to satisfy the inspecting engineer that all the equipment/accessories conform to BIS or any other standard in absence of marking on such equipment/accessories. All these equipment/accessories will be subjected to periodic tests and records maintained. System of periodic maintenance of M&P must be in vogue and proper record maintained.

6.6 There shall be a system to ensure the traceability of the product from raw material stage to finished stage.

6.7 Firm should have Quality Assurance Plan (QAP as per RDSO's latest ISO Apex Document) for the product manufactured by them detailing various aspect –

- Organization chart
- Flow inspection details
- Stage inspection details
- Control measures for various parameters for ensuring quality.

6.8 Firm must have and maintain the ISO 9001 Certification, as per instructions issued by Ministry of Railway (Railway Board) vide letter No. 2014/CE-III/BR/Bridge workshop policy dated: 16/19.05.2025 and further circulated vide RDSO's letter No. CBS/G/Reg dated 26.05.2025. These letters can be accessed under B&S Directorate's Documents (Vendor registration guidelines) through Vendor interface on RDSO's website at following URL https://rdso.indianrailways.gov.in/view_section.jsp?lang=0&id=0,4,28,6551. To implement ISO 9001 Certification through Bureau of Indian Standard (BIS), RDSO has already signed an MOU with BIS.

7.0 **Quality Audit**

7.1 Quality Audit of the Registered Vendors will be done every five years. However, it may be planned by RDSO after completion of three years since registration or previous quality audit.

7.2 The firm should satisfy the following requirements to continue as approved vendor:

(a) The firm must continue to maintain the infrastructure, facilities and Machineries & Plants as required at the time of Quality Audit as per prevailing STR.

(b) The firm must have executed/completed at least one work of Railway Bridge girder Fabrication since registration or previous quality audit. For the purpose of this clause, fabrication of at least one span against a multiple span bridge will be considered/ treated as completed work. The firm shall provide the Inspection/Passing certificate by RDSO/Railway's Fabrication Inspection Unit (FIU) /authorised Third Party Inspection (TPI) Agencies as applicable.

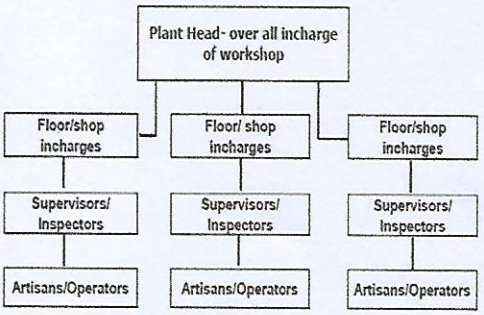
(c) The firm shall not have any adverse report from any of the Railways.

7.3 For Quality Audit, firm will be inspected and verified for facilities provided under Para 4 to 6 of this STR by RDSO team. The firm shall also give an undertaking that organizational and infrastructural requirement as required at the time of Quality Audit have been maintained.

7.4 If the firm does not satisfy the criteria given in Para 7.2 & 7.3 above, it will be delisted from approved list and firm shall have to apply afresh in case it desires to be registered again.

8.0 The firm shall display the following information/details to the customers at Home page under tab 'Vendor Approval RDSO' of their websites-

Item/Tab	Information/Sub-tab	Information/Sub-tab
Ownership details	Ownership Board of Director, Partners Registration / incorporation details, Memorandum and Article of association/ partnership deed/LLP agreement Registered address Contact information	

Item/Tab	Information/Sub-tab	Information/Sub-tab
Fabrication Units (for each unit)	Address	
	Facilities including details of Machinery & Plants as applicable (Brief description and photographs)	• Template layout area • Fabrication shop- Cutting, Drilling, Welding, Straightening, End milling • Blasting shop • Metalizing & Painting shop • Assembly area • Stacking area • Any other facility/area/shop
	Details of RDSO approval (Item Name & Item No. for which approved)	• Registration ID • Annual Production capacity • Last quality audit done on---- • Next quality audit due on-----
	Firm's Registration details (under The Companies Act/ The Micro, Small and Medium Enterprises Development Act)	
	Factory license details	
	ISO 9001 Certification	• Certifying body • Date of certification • Last date of surveillance audit • Last date of internal audit with details of compliances
	Organisation chart (as per given template) qualifications and experience details (in brief)	
	Details of testing facilities (i) Physical, chemical and mechanical (ii) DPT (iii) UT/PAUT/RT	In-house as well as Outsourced
	Mandatory approvals	NABL, AERB, ASNT etc.
	Artisans- involved in cutting, drilling, welding, blasting, metalizing and painting etc.	Qualification Certification/training/refreshers Experience
	Power demand & Installed power supply	
	Details of executed works/supplies in last 5 years (in	

Item/Tab	Information/Sub-tab	Information/Sub-tab
	Nos. of spans/tonnage/Nos.)	
	Works in hand (in Nos. of spans/tonnage /Nos.)	

8.1 It shall be mandatory to display the above details/information on the website within stipulated time. Displaying false information shall lead to outright delisting for two years as per Para 4.2.4 of RDSO ISO Apex Document No. QO-D-8.1-11 (as updated time to time).

9.0 RESPONSIBILITY AND AUTHORITY:

The following table indicates responsibility related to this document:

Activity	Responsible	Approver	Supporting	Consulted	Informed
Creation, maintenance of this document	EDBS	PED/Infra-II	Directorate Officials	-	Through intranet/ RDSO's public website
Compliance of Directive contained in this document	EDBS	PED/Infra-II	Directorate Officials	-	-
Requirement of Deviation from Directive	EDBS	PED/Infra-II	Directorate Officials	-	Through intranet/ RDSO's public website

ABBREVIATION:

PED = Principal Executive Director

EDBS = Executive Director/B&S

DBS = Director/Joint Director (B&S) Concerned

ADE/B&S = Assistant Design Engineer (B&S)/ Assistant Engineer (Insp)/B&S concerned

SSE = Senior Section Engineer (Design/Research/Inspection)

JE = Junior Engineer (Design/Research/Inspection)