Issued by email on 28.10.2024

2020/17/CE-III/BR/GirderInspection

I/3108447/2024

भारतसरकार GOVERNMENT OF INDIA
रेलमंत्रालय MINISTRY OF RAILWAYS
(रेलवेबोर्ड RAILWAY BOARD)

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No. 2022/19/CE-III/BR/Girder Inspection (E-3322338) New DelhiDated 18-10-2024

General Manager/Const (NFR)
All CAO/C &PCEs,
Zonal Railways

Sub: Planning of non-standard spans of Open Web Girders for New line, Doubling and Multi tracking Works of Railways

Ref : (i) 2013/CE-III/BR/RDSO/Misc. dated 04-6-2014 and 11-08-2014
(ii) RDSO letter No. CBS/DOW dated 18.10.2024

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A case of rejection of Non-standard Open Web Girder has come to the notice of Railway Board wherein besides issue of insufficient camber, one of the bottom chords was found having been repairedfor the damagecaused during erection. It needs to be understood that the railway bridges are subject to heavy dynamic loads and stress concentration generated at such repaired locations will cause early fatigue failures. One of the IITs has approved the repairs without any technical examination of the likely adverse implications of the repairs done.

2.0 Several cases are reported where the Non-standard designs are being proposed with a small variation with respect to standard span. Design of Open Web Girders is a specialized job where camber & pre-stressing are provided in truss members and strict quality control is maintained at fabrication workshops to ensure that notches in fabricated parts are avoided and there are no locations of stress concentration except those provided in design.

3.0 In view of above, it has been hereby decided that the non-standard Open Web Girders shall only be planned when these are totally unavoidable. Prior approval of Railway Board shall be taken through PCE with complete justification. Detailed instructions in this regard are contained in the **Annexure-I** attached.

This is issued with the approval of Member Infra, Railway Board.

DA: As above

Signed by
Ravindra Kumar Goel
Date: 26-10-2024 12:41:18

(Ravindra Kumar Goel)
Principal Executive Director/Bridge
Railway Board

Copy to : (i) DG/IRICEN, Pune for information
(ii) PED/Infra-II, RDSO, Manak Nagar, Lucknow for information & necessary action.
(iii) MD/CMD, RITES, IRICON, RVNL, KRCL, MRVC & DFCCIL etc. for information

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Annexure-I

(Ref : Rly Bd L No. 2022/19/CE-III/BR/Girder Inspection (E-3322338)New Delhi Dated 18-10-24)

Use ofNon-standard spans of Open Web Girders (OWG)

1. Railway Bridges are vital links over rivers & roads etc. They are not only to be constructed but have to be maintained well for longer service life. The designs of standard spans are validated over a period of time and maintenance issues are understood well and methods for remedial attention are also standardized. Besides this quick replacement of standard girders is possible during emergency restoration as fabricated girders of similar type can be easily diverted from other ongoing works.

2. In view of above, it has been advised time to time that only standard span shall be adopted in all new line/doubling /multi tracking projects of railways. To overcome site constraints, pier caps may be suitably projected to meet the actual requirements of standard spans. In case new bridge is to be located close to existing bridge, staggering of pier arrangement with respect to existing piers may be considered. The scour control measures during the design of new foundations or protection of existing foundations from anticipated scour may be considered with requisite hydraulic studies.

3. Non-standard spans for OWG shall be adopted only in un-avoidable situations with prior approval of Railway Board. The proposal shall be submitted by PCE after examining the justification and professional capacity of the executing unit to get a good design and quality execution done.

4. If non-standard spans are adoptedcare shall be taken,while designing,to follow available RDSO standard drawings of nearest OWG span with minimum required changes made to meet the essential design requirements. Complete procedure of detailed design, however shall be followed as per DBN approved by RDSO. As per extant instructions, design of all non-standard spans of OWG shall be approved by Zonal Railways.

5. **Design Basis Notes (DBN)** of Non-standard spans of OWG in all bridges shall be approved by RDSO. Critical values of various design parameters such as loading, fatigue category, partial factor of safety, type and specifications of HSFG bolts etc. shall be specified in DBR/DBN. Connection design at every node shall be examined carefully with respect to member capacity and number of rivets/HSFG bolts required/ provided. RDSO shall also specify the check points of vital design stages so as to ensure that design process is followed correctly by DDC & PC. The stages of fabrication process to be inspected by DDC & PC and QAP shall be part of **DBN.**

6. Designs may either be done by in-house Design Cell of CAO/C or through outsourcing the work to competent Detail Design Consultants (DDC) duly proof checked by Proof Consultants (PC). In the later case also, the design cell shall be involved to verify that the design is being done as per the approved DBN and all vital design stages are completely satisfactorily.

7. The engagement of DDC and PC and quality of fabrication shall be regulated and monitored as under :

    a. Only competent DDC and PC of repute,having professionally trained designers, shall be awarded the consultancy works. DDC and PC shall be engaged from the very beginning of the project and they shall remain associated with the construction

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of bridge till commissioning/defect liability period. During construction stage, same DDC and PC will provide necessary advice/ design modification as and when warranted.

b. While engaging Proof Consultants, any conflict of interest with DDC or Contractor shall be avoided. IIT/NIT may be associated for technical guidance & opinion only in exceptional cases.

c. Same DDC and PC shall be involved in the design of foundation, substructure, super structure, launching & erection schemes, temporary works, formwork etc. to safeguard against any mismatch in designs, proper estimation of various loads or damage during the final erection on sub-structure.

d. Professional Liability clause of sufficient duration shall be added in the contract of DDC and PC. The responsibility of these Consultants in case of any failure shall be clearly laid down in tender conditions. Necessary certificates from DDC & PC shall be taken on design documents and drawings before release of drawings for fabrication & construction.

e. Based on design drawings and approved DBN submitted, the PC shall check the adequacy of design based on **independent analysis** performed on separate software *(other than that used by Design Consultant)* as per load parameters & codal provisions given in **DBN.** PC will also check detailing of all the load bearing connections and bearings in his independent report.

f. Fabrication workshop shall be selected carefully after ensuring its past experience & capacity to deliver the span of girder. During fabrication of steel girders, the DDC & PC shall associate with Field engineers/PMC and inspect the work of fabrication at different stages to ensure that the quality of work is achieved as per specifications, design assumptions made and precautions required from fatigue consideration etc. All the requirement of RDSO specification (B-1: 2000) and approved QAP shall be met with to the full satisfaction of DDC & PC. The fabrication stages shall be mentioned in the DBN and approved by RDSO. Based upon their certified technical report, project executing authority shall raise the inspection call to RDSO/TPI.

g. Erection methodology given by the construction agency duly approved by Field engineers /PMC, shall be scrutinized by the DDC and PC to check for any unwanted erection stresses coming up at different stages. Sufficient factor of safety at every stage shall be ensured. Structural adequacy of members and joints to withstand the erection and launching forces, wind forces etc. shall be certified by these consultants. Deficiencies, if any, shall be pointed out clearly in the technical report and the certificate of satisfactory completion shall be given for that stage of erection and launching. Detailed technical report from DDC & PC must be ensured before undertaking next stage of erection/ launching.

8. These are minimum instructions for guidance and do not restrict project execution authority or CAO(C) to implement other necessary instructions for better quality control on thedesign activities and related fabrication & erection work as per actual requirements.

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RAILWAY BOARD

No. 2013/CE-III/BR/RDSO/Misc. **New Delhi, dt. 04.06.2014**

1. **Principal Chief Engineers,**
   All Indian Railways.

2. **Chief Administrative Officer (Con.)**
   All Indian Railways.

Sub.: Use of Standard drawings on railway system.

The task of developing standard drawings for the zonal railways has been entrusted to RDSO to get the benefit of better designs. However, it has been noted that sometimes zonal railways are not willing to use standard drawings and insist on developing drawings for situations where standard drawings are available. This entails unnecessary duplication of work and goes against the spirit in which RDSO has been entrusted the task of standardization of drawings.

2.0 In view of the above, it is advised that henceforth standard drawings available with RDSO may be used as far as feasible while planning of any work. In case non-standard drawings are required to be used, specific approval from RDSO may be obtained, giving detailed reasons / justification for not using the standard drawings.

V. Jain 4/6/14.

(V.K. Jain)
Director Civil Engg (B&S)
Railway Board

Copy to:

1. **Chief Bridge Engineers, All Indian Railways** for information and necessary action.
2. **CMD, Rail Vikas Nigam Ltd., New Delhi – 110006,** for information & necessary action.
3. **Executive Director/B&S/RDSO,** for information & necessary action.
4. **Executive Director/Structure/RDSO,** for information & necessary action.

Government of India
Ministry of Railways
(Railway Board)

No. 2013/CE-III/BR/RDSO/Misc. New Delhi, dated 11-08-2014

Principal Chief Engineer,
All Indian Railways.

Chief Administrative Officer (Con)
All Indian Railways

Sub: Use of Standard drawings on railway system.
Ref: This office letter of even No. dated 4/6/2014.

Vide this office letter under reference above, railways were advised that standard drawings available with RDSO be used as far as feasible while planning any work and in case, non standard drawings are required to be used, specific approval from RDSO may be obtained giving detailed reasons/justification for not using the standard drawings. The intentions was to get benefit of better designs so as to avoid unnecessary duplication of works and wastage of time in designing the non standard drawings.

2.0 On the above issue, many railways have represented to review the instructions stating that they are having large no. of targeted works relating to new line, doubling, ROB, RUB etc. in which using non standard drawings are unavoidable and getting specific approval from RDSO will take time to finalise the plans and may result in delay in execution of targeted works.

3.0 In view of above, the matter has been reviewed and it has been decided that railways should use standard drawings for superstructure as far as feasible. However, in case non standard drawings are unavoidable then railway may use the same with the specific approval of concerned CAO(C)/PCE. While according approval of the same, CAO(C)/PCE should record the specific reasons/justification for using non standard drawing. A copy of the drawing alongwith related design/details may be furnished to RDSO.

11/8/14

(V.K.Jain)
Director Civil Engg./ B&S
Railway Board

Copy for information and necessary action to:

1. **Chief Bridge Engineers, All Indian Railways**
2. **CMD, Rail Vikas Nigam Ltd, New Delhi**
3. **Executive Director/B&S/RDSO, Lucknow**
4. **Executive Director/Structures/RDSO, Lucknow**

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राजेश कुमार श्रीवास्तव
Rajesh Kumar Srivastava
कार्यकारी निदेशक/पु0एवंसं0
Executive Director/B&S

सत्यमेव जयते

भारतसरकार- रेलमंत्रालय
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Email : edbsrdso@gmail.com

सं०. CBS/ DOW

दिनांक : 18.10.2024

PED/Bridge
Railway Board
Rail Bhawan
New Delhi

Sub : Draft instructions w.r.t . use of Non Standard Open Web Girders for Railways.

Ref.: Railway Board's message on whatsapp.

In reference to above subject, draft instructions received from Railway Board regarding engagement of design consultant for adopting Non Standard Open Web Girders for Railways, is sent duly corrected herewith for perusal and consideration please.

DA: As above

18/10/2024

(राजेश कुमार श्रीवास्तव)
(Rajesh Kumar Srivastava)
कार्यकारी निदेशक /पुल एवं संरचना
Executive Director/B&S

Revision-R1

Annexure-I

(Ref : Rly Bd L No. Dated….)

Use of Non-standard spans Open Web Girders (OWG)

1. Railway Bridges are vital links over rivers & roads etc. They are not only to be constructed but must be maintained well for longer service life. The designs of **standard spans** are validated over a period and maintenance issues are understood well and methods for remedial attention are also standardized. Besides, ~~this~~ quick replacement of standard girders is possible during emergency restoration as fabricated girders of similar type can be diverted from other ongoing works.

2. In view of above, it has been advised that only standard span shall be adopted in all new line/doubling /multi tracking projects. To overcome site constraints, pier caps may be suitably projected to meet the actual requirements of standard spans. In case new bridge is to be located close to existing bridge, staggering pier arrangements with respect to existing piers may be considered. The scour control measures may be planned during the design of new foundations or protection of existing foundations with requisite hydraulic studies.

3. Even when OWG of non-standard spans are adopted, care shall be taken to follow available RDSO standard drawings of nearest OWG span with minimum required changes made to meet the essential design requirements.

4. Non-standard spans for OWG shall be adopted only in un-avoidable situations with **prior approval of Railway Board**. As per extant instructions of Railway board, design of all non-standard spans of OWG shall be approved by Zonal Railways.

5. ~~**Design** Basis **Notes (DBN)** of Non-standard spans of OWG in all bridges shall be approved by RDSO~~ **Design Basis Report (DBR)/Design Basis Notes (DBN)** of Non-standard spans of OWG in all **important bridges** shall be approved by RDSO and other bridges by Zonal Railways based on **model DBR/DBN issued by RDSO**. DBR/DBN of Non-standard OWG of span more than 106.7m *(largest RDSO standard span),* however, shall be sent invariably to RDSO irrespective of important bridge or otherwise. Critical values of various design parameters such as loading, fatigue category, partial factor of safety, type, and specifications of HSFG bolts etc. shall be specified in DBR/DBN. Connection design at every node shall be examined carefully with respect to member capacity and number of

rivets/HSFG bolts required/ provided. RDSO shall also specify the check points of vital design stages to ensure that design process is followed correctly by DDC & PC. The stages of fabrication process to be inspected by DDC & PC and QAP to be followed shall also be part of DBN.

6. Designs may either be done by in-house Design Cell or through outsourcing the work to competent Detail Design Consultants (DDC) duly proof checked by Proof Consultants (PC). In the latter case also, the Zonal design cell shall be involved to verify that the design is being done as per the approved DBN and all vital design stages are covered satisfactorily.

7. The engagement of DDC and PC shall be regulated as under:

   a. Only competent DDC and PC of repute shall be awarded the consultancy works. DDC and PC shall be engaged from the very beginning of the project and they shall remain associated with the construction of bridge till commissioning/defect liability period. During construction stage, same DDC and PC will provide necessary advice/ Design modification whenever warranted.

   b. While engaging Proof Consultants, any conflict of interest with DDC or Contractor shall be avoided. IIT/NIT may be associated for technical guidance & opinion only.

   c. Same DDC and PC shall be involved in the design of foundation, substructure, superstructure, it's launching & erection scheme, temporary works, formwork etc.

   d. Professional Liability clause of sufficient duration shall be added in the contract of DDC and PC. The responsibility of these Consultants in case of any failure shall be clearly laid down in tender conditions.

   e. Based on design drawings and approved DBN submitted, the PC shall check the adequacy of design based on **independent analysis** performed on separate software *(other than that used by Design Consultant)* as per load parameters & codal provisions ~~given~~. PC will also check detailing of joints ~~all the load bearing~~ in his independent report.

   f. During fabrication of steel girders, the DDC & PC shall associate with Field engineers/PMC and inspect the work of fabrication at different stages to ensure that the quality of work is achieved as per specifications, design assumptions and precautions for fatigue etc. as per the requirement of RDSO specification (B-1: 2000) and approved QAP. All these stages shall be mentioned in the DBN ~~and approved by RDSO~~. The fabrication inspection report shall be submitted by DDC and PC in writing duly covering the aspects. Based upon this technical report, Project Executing Authority shall raise the inspection call to RDSO/TPI.

g. Erection methodology given by the construction agency duly approved by Field engineers/PMC, shall be scrutinized by the DDC and PC to check for any unwanted erection stresses coming up which may be a cause of unsafe working. Sufficient factor of safety at various stages shall be ensured. Structural adequacy of members and joints to withstand the erection and launching forces, wind forces etc. should be certified by these consultants. Detailed technical report from DDC & PC must be ensured before the erection/launching work is undertaken.

h. Thorough technical audit of erection and launching scheme shall be done by DDC & PC at various stages as mentioned in approved erection and launching scheme. The work of every stage shall be certified to be safe as per design before proceeding to next stage. Deficiencies, if any shall be pointed out clearly in the technical report and the certificate of satisfactory completion shall be given for that stage of erection and launching.