Northern Railway

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Sr.D.E.N./C
Northern Railway
Delhi, Ambala, Moradabad, Lucknow & Ferozpur.

Sub: Guidelines for Inspection of PSC and RCC (Rail and Road Bridges) Superstructure.

It has been noted that there is need to improve the quality of inspection of RCC & PSC superstructure. Accordingly, guidelines on the subject has been prepared and annexed for strict compliance during inspection. A copy of the same should also be placed in each bridge register for ready reference.

Detailed instructions regarding inspection and maintenance of bridges are available in a publication of IRICEN, Pune titled "BRIDGE INSPECTION AND MAINTENANCE" (Dec'2005). The content can be downloaded from IRICEN web site or book may be purchased and circulated.

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GUIDE LINES FOR INSPECTION OF PSC AND RCC (RAIL AND ROAD BRIDGES) SUPERSTRUCTURE

There has been sizable increase in no of bridges (including ROBs) with RCC/PSC superstructures. Now a days, for spans less than 12.2 m the use of steel girders has by and large been discontinued and these are being provided with RCC/PSC super-structure. RCC super-structures are being provided only for small spans (less than 3.0 m) or in boxes as integral super-structure. PSC spans have been provided for larger spans (> 3.0 m to 30.5 m). In some cases, PSC spans have been provided up to 102 m also. Hence, the inspection of RCC/PSC super-structure needs to be carried out with due diligence to identify any problem so as to take timely remedial measures. Following guidelines may be kept in mind while inspecting a PSC super-structure which are also equally applicable for inspection of RCC super-structures.

i) The concrete girders shall be examined for spalled, disintegrated, cracked or honey-combed areas, especially over the bearings. Cracks at ends of beams which spread up from the bearing seat should be considered as serious problem. Cracks parallel to the beams on the faces of bottom bulbs of beams are normally due to corrosion and occur when the concrete in bulb-corners is about to spall. These should be checked by tapping the concrete firmly with a hammer.

ii) The soffit of the lower slab in box girder structure and outside faces of girders shall be examined for any significant cracks.

iii) In case cracks are noticed, these shall be measured for length and maximum width and marked on girder by drawing a line parallel to crack in paint. Each crack shall be numbered and its no, date of detection and length shall be painted by the side of crack. These details along with a sketch of crack shall be entered in bridge register also. Suitable tell-tales shall be put up to observe the cracks minutely and to ascertain whether the cracks are developing further or not. All telltales fixed in previous inspections shall be carefully observed to identify any live crack.

iv) The progress of the cracks already identified in the previous inspections should be observed and noted.

v) Ventilation holes are provided in soffit and web of box girders to reduce differential temperature stresses. It should be observed whether ventilation holes are open for proper flow of air. Webs of box girders shall be inspected for cracks which may occur due to temperature stresses.

vi) For under-bridges, the under-side of the girders shall be examined for any damage due to loads of excessive height passing under the under-bridge.

vii) Any unusual deflection or vibration observed shall be recorded.

viii) The concrete decks shall be examined for cracking, leaching, scaling, pot-holing(in ROBs), spalling and other signs of deterioration. Each of these shall be evaluated to assess the overall effects on the structure and the restoration work required to be done shall be clearly specified. Any signs of deterioration in reinforcing steel shall be examined to ascertain the extent of deterioration.

ix) In ballasted deck bridges and ROBs with asphaltic wearing coat, inside of the deck should be inspected to reveal the area of distress or deterioration. Efforts shall be made to examine such areas by removing the ballast/asphaltic wearing coat as frequently as possible. Any evidence of water passing through the cracks of the deck shall be recorded.

x) Condition of area around drainage pipes, which is more prone to corrosion/damage, shall be observed for any deterioration.

xi) Ballast cushion shall be recorded. If the ballast cushion is observed to be less than minimum cushion (300 mm) or increases beyond design limits (normally 400 mm), remedial measures should be planned to rectify the problem.

xii) Similarly wearing coat thickness on ROB should also be recorded. If it is observed to be more than 100 mm (max design thickness), the issue should be taken up with concerned road authorities for resurfacing after proper scraping of old surface.

Additional items for pre-stressed super-structures

xiii) The pre-stressed concrete members shall be examined for loss of camber, excessive deflection, distress due to buckling and deterioration of concrete, cracking or spalling in the area around the bearings and in anchor zone.

xiv) Camber should be measured in accordance with ACS NO.22 dated 28.3.2011 of IRBM, which is reproduced below for ready reference.

Para 1107 (15) (b)(i)- In case of PSC girders, assessment of loss of camber should be done. Camber measurement should be at centre up to 20m span and at centre & quarter points for spans more than 20m. Camber measure men would be entered in column 8 of Annexure 11/9.

xv) In post tensioned members, the end anchorages shall be examined for water tightness and corrosion of pre-stressing wires. Signs of bursting in anchor zone shall be carefully looked for.

xvi) In pre-tensioned members, end faces of members should be observed for corrosion of pre-stressing wires.

xvii) PSC slabs/girders shall be observed under heavy load (usually locomotive, loaded goods train, trailer trucks for roads etc.) for opening of any old crack.

xviii) Any cracking in pre-stressed members in transverse direction shall be taken seriously and its complete details (location, length, width, depth, inclination etc.) shall be recorded. Crack shall be marked as detailed in (iii) above.

xix) Cast-in-place diaphragms between longitudinal girders must be looked for presence of cracks due to creep/shrinkage of concrete in the girders.