1.0 General

Inspection, in general, means visits to carefully examine and find out the defects in the structure and to see that rules and instructions as prescribed in relevant codes and manuals are implemented.

Maintenance is the activity through which the defects as noticed during inspection are attended to prolong the life of structures and rehabilitate them wherever necessary and possible.

Safety of Structures, especially Platform Shelters, Workshop Sheds, Bridge Girders over Water Ways, Road Over Bridges (ROBs)/Rail Under Bridges (RUBs) and Foot Over Bridges (FOBs) is accorded very high priority through a rigorous process of inspections spanning different levels across the railways.

- *It is also noted that open line maintenance unit of railway often felt handicapped due to non-availability of completion plan and detailed drawings.*
- *For effective maintenance of structures, the proper documentation during inspection should be done and made available during maintenance activities.*

2.0 References

- Railway Board's Instructions
- RDSO Guidelines
- IRICEN Books
- PCE/CBE Circulars
- Manuals of Indian Railway – IRBM, IRWM & IRPWM

3.0 Duties & Responsibilities of Railway Officials

The Indian Railway Works, P.Way & Bridge Manuals may be referred to for duties in details of each and every Railway Official, who is fully responsible to carry out inspections and maintenance of steel structures in his jurisdiction.

3.1 Inspection Schedule of Senior Section Engineer:

S. No.	Items of Inspection	Periodicity	Reference	Remarks
SSE (Works)				
1.0	Inspection of Steel structures such as Workshops, Running sheds, Platform covers, FOBs and Flood light Towers.	One fifth every year	Para 228 (a) of IRWM	On a programmed basis
	Cast iron, Wrought iron or Pressed Steel Plate water tanks and staging whether of steel sections or rails.	As required.		-
	Structures with roof trusses	10% to 20% test check inspection of structures under each group.		-
	Other structures in which timber, rail or steel work is used to support any part of the structure.			
	Tie rods of arched roofs excluding jack arches.			
	Wrought iron or mild steel tanks on sleeper cribs at temporary watering kilo-metreages			
	Inspection of bridges minor, major and important including ROB/ RUB/FOB (except track and approaches) (as per practice of railways)	Once a year	Para 117 & 1101 of IRBM	Prior to monsoon
	Detail inspection of steel girder less than 12.2 m clear span (as per practice of railway)	Once in five years	Para 1101 (a) (iv) of IRBM	20% per year
1.1	Advertisement hoardings situated alongside the running lines particularly in the Suburban sections - corrugated iron sheets likely to get loose by gusts of wind or by the aero-dynamic force generated by passage of fast train in proximity of running lines	Thorough inspection once in 6 months	Para 224(f) of IRWM	In rotation to ensure integrity of hoarding components
SSE (P.Way) (Over all in-charge/ Sectional)				
2.0	Bridge (Over all in-charge) - inspection of track & approaches of all bridges. - inspection of run off frames if any & foot path on bridges.	Once in a year	Para 1101 (b) of IRBM	In prescribed month before monsoon
SSE (Bridge)				
3.0	All welded, RCC, PSC and composite girders and their bearings.	Within one year of Installation.	Para 107 (1a) of IRBM	Initial inspection
	Girders which are overstressed and kept under observation	Once a year or at intervals specified by the CBE	Para 107 (1b) & 1102 (d) of IRBM	-
	Floor system of early steel girders	Once a year	Para 107(1c) of IRBM	-
	Superstructure including bearings of all steel girders of span 12.2m and above, RCC,PSC and composite girder bridges.	Once in five years (on planned basis)	Para 107 (1d) & 1102 (1a) of IRBM	About 20% of inspection being carried out every year
	Other nominated steel structures, being maintained by Bridge Inspector	Once in five years.	Para 107(1e) of IRBM	-
3.1	Rivet testing of girders of Span > = 12.2 m	25 % of total girders per year	IR Technical Handbook on Bridge Inspection & Maintenance by RDSO	In Coastal region
		20 % of total girders per year		In Non-coastal region
3.2	Oiling & Greasing of bearings of Girder Span > = 12.2 m	Once in 3 years		-
3.3	Painting of girders of Span > = 12.2 m	Once in 3 years		In Coastal region
		Once in 6 years		In Non-coastal region
3.5	Welded girders	Once in three years	Para 1102 (1b) of IRBM	-
SSE (Concerned)				
3.6	Inspection of Distressed Bridges: Distress in girders: a) If corrosion is heavy, regirdering should be proposed. b) If there are many loose rivets, turned bolts should be provided and speed restriction imposed as necessary. The turn bolts should be replaced by rivets before relaxing the speed restriction.		Para 520 of IRBM	-

3.2 Inspection Schedule of Assistant Divisional Engineer (Open Line):

- Responsible for the maintenance and safety of all way & works including bridges in his charge.

- Maintenance of steel work of girder spans less than 12.2 m clear and other type of bridges except composite, RCC, PSC and steel girders of spans 12.2 m and more.
- In regard to steel work, the general condition of the girders and bearings should be examined paying special attention to places liable to corrosion and stress concentration (in welded girders) and the condition of paint.
- Maintenance of All other steel structures like FOB, Sheds/ Shelters etc.
- Submission of Bridge Registers with his certificate of completion of Bridge Inspections to Divisional Engineer.

S. No.	Items of Inspection	Periodicity	Reference	Remarks
1.0	**Bridges:**			
1.1	Inspection of every Bridge including Road over / under Bridges	Once in a year after monsoon	Para 102, 1103 (1)(a) of IRBM	To be Completed by a date specified by Chief Engineer
1.2	Inspection of Distressed Bridges:			
	Distress in girders: a) If corrosion is heavy, re-girdering should be proposed. b) If there are many loose rivets, turned bolts should be provided and speed restriction imposed as necessary. The turn bolts should be replaced by rivets before relaxing the speed restriction.		Para 520 of IRBM	-
1.3	Inspection of Bridges, whose condition warrants special attention	To be inspected more frequently	Para 1103 (b) of IRBM	-
2.0	**Steel Structures (Other than Girder Bridges):**			
2.1	Inspection of Steel structures such as Workshops, Running sheds, Platform covers, FOBs and Flood light Towers.	One fifth every year	Para 228 (a) of IRWM	On a programmed basis
2.2	Cast iron, Wrought iron or Pressed Steel Plate water tanks and staging whether of steel sections or rails.	As required		-
2.3	Structures with roof trusses	10% to 20% test check inspection of structures under		-
2.4	Other structures in which timber, rail or steel work is used to support any part of the structure.			
2.5	Tie rods of arched roofs excluding jack arches.			
2.6	Wrought iron or mild steel tanks on sleeper cribs at temporary watering kilo-metreages	each group		
2.7	Structures, whose condition warrants special attention, should be inspected..	More frequently	Para 228 (b) of IRWM	-

3.3 Inspection Schedule of Assistant Engineer / DEN (in-charge of bridges in division):

- He will render help to the Divisional (open line) staff for heavy repairs of steel work in girder spans of less than 12.2m clear as cannot be taken by Divisional staff.
- He will also maintain the other steel structures as ordered by the Chief Engineer.
- Scrutiny of registers sent by Bridge Inspector for maintenance and inspection of steel work of bridges.

S. No.	Items of Inspection	Periodicity (Interval)	Reference	Remarks
1.0	Referred bridges	Call for his inspection	Para 105 (2) & 1105 of IRBM	Based on scrutiny of the Bridge Inspector's register
	Overstressed girders with camber loss	As noted		-
	Bridges which have been referred	As referred		Referred by BRI
	Inspection of steel Girders 12.20 m spans and above Bridges as inspected by BRI	10% test check of Bridges inspected by BRI every year		As mentioned by BRI
	All steel structures	At specified intervals		As ordered by the CE
2.0	Inspection of steel structures (workshops, locosheds and any other light steel structures)	Once in five years	Para 901(3a) of IRBM	-
3.0	Inspection of Structures warranting special attention	More frequently	Para 901 (3c) of IRBM	-

Assistant Bridge Engineer				
4.0	Inspection of Distressed Bridges:			
	Distress in girders: a) If corrosion is heavy, regirdering should be proposed. b) If there are many loose rivets, turned bolts should be provided and speed restriction imposed as necessary. The turn bolts should be replaced by rivets before relaxing the speed restriction.		Para 520 of IRBM	

3.4 Inspection Schedule of Dy. CE (Bridge):

S. No.	Items of Inspection	Periodicity (Interval)	Reference	Remarks
1.0	Steel work of Bridges	Called for his inspection	Para 1106 (2a) of IRBM	After scrutiny of register by DEN (Br)/ AEN (Br)
		Referred bridges in BRI Register	Para 1106 (2b) of IRBM	As directed by CBE

3.5 Inspection Schedule of Sr. DENs/ DENs (Sectional):

- The inspection is based on Assistant Engineer's Inspection Register which is scrutinized by a specified date and endorsed with a certificate as per Para 1104(2) of IRBM. The register is further submitted to the Territorial Head of the Department for orders.
- The register is then sent to the Assistant Engineer for noting his orders with instructions to return them within ten days and to intimate the same to the Inspectors concerned and ensure expeditious compliance.

S. No.	Items of Inspection	Periodicity (Interval)	Reference	Remarks
1.0	**Bridges**			
	All Important Bridges - those having a linear waterway of 300 metres or a total waterway of 1000 Sqm or more and those classified as important by the Chief Engineer / Chief Bridge Engineer.	Once in a year	Para 1103 (3)(a) & 1104 (1) of IRBM	-

1.2	Bridges referred by ADEN after his inspection and bridges call for inspection after scrutiny of Registers	On reference		-
1.3	Bridge with Overall Rating number (ORN) 1,2,3	Minimum of Once in a year of all those bridges for which ORN is 1,2,3	Para 1104 (3) of IRBM	Bridges with ORN 1 to be a distressed bridge
1.4	Inspection of Distressed Bridges:			
	Distress in girders: a) If corrosion is heavy, regirdering should be proposed. b) If there are many loose rivets, turned bolts should be provided and speed restriction imposed as necessary. The turn bolts should be replaced by rivets before relaxing the speed restriction.		Para 520 of IRBM	-

4.0 Items to be checked for Inspection

4.1 For Steel Structures (Other than Girder Bridges)

S. No.	Item to be inspected	Remarks
Para 229 IRWM		
• Workshops, Running Sheds and Platform Covers in which Roof Trusses are fixed to built up Stanchions • CI/WI/Pressed Up Steel Water Tank & Staging & Flood Light Towers		
1	Whether truss/column is in sound condition?	Yes/No
2	Whether all fixtures are intact in bed blocks or pedestals?	Yes/No
3	Whether the condition of paint is in good condition?	Yes/No
4	Whether date of painting is mentioned on the structure?	Yes/No
5	Whether corrosion of steel is taking place?	Yes/No
6	In the case of steel work built into masonry, such as tie rods of arched buildings, whether any corrosion is apparent near the masonry?	Yes/No
7	Whether the condition of rivets, bolts and tie rods particularly of water storage tanks are in sound condition?	Yes/No
8	Whether any crack have developed in cast iron tank plates?	Yes/No
9	Whether any deformation of the structure has occurred?	Yes/No
10	Whether anchor-bolts are tightly fastened to foundations & bearings?	Yes/No
11	Whether any crack has developed in CI/WI/Pressed up steel/tank plates?	Yes/No
12	Whether bed blocks or pedestals are in sound conditions?	Yes/No
13	Whether any sign of leakage has been detected in water tank?	Yes/No
14	Whether the inspecting official makes a thorough examination of every part of a structure in all respect?	Yes/No
Para 210 IRWM		
15	Whether paint as specified is applied on all steel work in station buildings, offices and residential quarters	Yes/No
16	Whether paint as specified is applied on all steel work of platform shelters.	Yes/No
17	Whether paint as specified is applied on all steel work in foot over, bridges, signal gantries goods sheds and small workshops	Yes/No
18	Whether paint as specified is applied on all steel work in power houses and large workshops	Yes/No
19	Whether paint as specified is applied on all steel work in water tanks and stagings	Yes/No
20	Whether all exposed steel work is provided with a primary coat of red lead and appropriate final coats. - C.G.I. sheets should not be painted unless they are in corrosion prone areas.	Yes/No
Para 228(b) IRWM		
21	Whether the records of result of inspection of structural steel are recorded by SSE (Works) in inspection register as per annexure 2.8 of IRWM and submitted to ADEN by the prescribed date	Yes/No
Para 537(a) IRWM		
22	Whether action to be taken as per IRBM for inspection, maintenance and painting of steel work of storage tank.	Yes/No

4.2 For Steel Structures (Girder Bridges)

S. No.	Item to be inspected	Remarks	Ref.
1	Whether the bridge is Minor (Individual span < 12 m & Total Linear Waterway < 18 m)?	Yes/No	IRBM-1103 (3) (c)
2	Whether the bridge is Major (Individual span >12 m or Total Linear Waterway > 18 m)?	Yes/No	IRBM-1103 (3) (b)
3	Whether the bridge is Important bridge (Total Linear waterway 300 m OR Total Waterway 1000 m^2 OR those classified as "IMPORTANT BY CE/CBE")?	Yes/No	IRBM-1103 (3) (a)
4	Whether the date of Inspection is indicated on the bridge?	Yes/No	IRBM-203 (1)
5	Whether the date of Painting is indicated on the bridge?	Yes/No	IRBM-203 (1)
6	Whether the date of Cleaning & Greasing is indicated on the bridge?	Yes/No	IRBM-1107 (4) (v)
7	Whether the date of lubrication of bearing is indicated on the bridge?	Yes/No	
8	Whether Bridge/FOB is over railway track? Whether clearances are as per SOD? If so, what is vertical clearance (5870 mm / 6350 mm)?	Yes/No Yes/No …….	SOD CH-1 (10) (iii) IRBM-1107 (14a) (ii)
9	Whether the clear horizontal distance between respective centre of track and any other structure is inspected? If so, what is clear horizontal distance (limiting value 2135 mm)?	Yes/No …… .	SOD CH-1 (8)
10	Whether Trolley refuge is provided?	Yes/No	IRBM-1107(8)
11	Whether creep of bridge girder is noticed?	Yes/No	-
12	Whether condition of the footpath is good?	Yes/No	IRBM-1107(9)
13	Whether condition of drainage arrangement is good?	Yes/No	IRBM-210(2)
14	Whether the Camber has been recorded at the time of Inspection? What is the Camber a) As per Drawing? b) As per time of Last inspection? c) At the time of Present Inspection?	Yes/No .. mm .. mm .. mm	IRBM-212 IRBM-1107 (15) (b)
15	Whether the bridge is to be inspected at increased frequency?	Yes/No	IRBM-107(1)
16	Whether the entries are made in Bridge History Book?	Yes/No	IRBM-107(2)
17	Whether the Steel members are free from distortion?	Yes/No	IRBM-1107 (5)(c)
18	Whether the Steel members are free from Corrosion?	Yes/No	IRBM-216
19	Percentage of Defective, Broken, Loose, Corroded & Badly Driven rivets a) Boom Flanges b) Web c) Main Joints d) Cross Girders e) Stringers f) Bracing& Foot Path g) Base Plate	 ….. % ….. % ….. % ….. % ….. % ….. % ….. %	IRBM-215(3)
20	Whether any member of steel girder is overstressed? (As advised by CBE)	Yes/No	IRBM-212(a)
21	Whether steel members are free from cracks?	Yes/No	IRBM-213(1)
22	Whether Early steel girder floor system is inspected once in a year? If so, what is the Last inspection date?	Yes/No ……..	IRBM-107(1) (c), 1102-(1) (e)
23	Whether Welded girder is inspected once in a three years? If so, what is the last inspection date?	Yes/No ……	IRBM-1102-(1) b

24	Whether proper scraping done wherever required?	Yes/No	IRBM-217-(1) b
25	Whether there is any local or uniform corrosion over large area?	Yes/No	IRBM-216-(3)(i)
26	Whether some pitting/corrosion is formed? If so, Location of Pitting/ corrosion?	Yes/No	IRBM-216-(3)(ii), 1107 (5) (f)(xvii)
27	Whether the average thickness of paint film is as per following requirement? a) Metalising (150 Micron) b) Epoxy Painting (200 Micron)	Yes/No	IRBM-218- (1) (ii) (b), 218-(2) (ii)
28	Whether the Painting has been done as per schedule (1 to 6 years)?	Yes/No	IRBM-217-(5)
29	Whether all Holding Down (HD) Bolts are intact? What is the percentage of intact bolts per bearing?	Yes/No …… %	IRBM-1107-(4)(ii)
30	Whether schedule of greasing (once in 3 years) of bearings has been carried out? If so, what is Date of greasing?	Yes/No ……	IRBM-222-(2) (a)
31	Whether there are any cracks in Knuckle slab, Saddle Plate and Roller?	Yes/No	BS-102-(3.2.3.1)
32	Whether bearing is centralized?	Yes/No	-
33	Whether replacement of oil in oil bath bearing is done? (once in 5 yrs) If so, what is Date of oil replacement	Yes/No ……	IRBM-222-(2) (f)
34	Whether connection of saddle plate with bottom boom is intact?	Yes/No	-
35	Whether condition of elastomeric bearing is examined? If so, then a) Is shear deformation more than 50% of height of pads? b) Is compression more than 5% of the height of Pads? c) While in rotation any loss of contact between bearing and girder?	Yes/No Yes/No Yes/No Yes/No	BS-102-(3.5.3)
36	Whether General condition of steel work of girders and bearings with special attention to places liable to corrosion are inspected.	Yes/No	Para 102(a) (ii) of IRBM
37	Whether steel structures as ordered by the CE at specified intervals are inspected by AEN(Bridge)/ DEN(Bridge) in-charge of bridges in division.	Yes/No	Para 105(3) of IRBM

38	Whether SSE (Bridge) has inspected - Floor system of early steel girders. - Superstructure including bearings of all Steel girders of span 12.2 m and above, RCC, PSC and composite girder bridges. - Other nominated steel structures.	Yes/No	Para 107(1) of IRBM
39	Whether SSE (Bridge) has with him the Inspection registers for steel work for bridges during Inspections of Higher officials	Yes/No	Para 110(b) of IRBM
40	Whether SSE (P.Way/Works) carried out maintenance of Steel work of girder spans less than 12.2m clear. (as per practice of railway)	Yes/No	Para 201(1c) of IRBM
41	Whether SSE (Bridge) carried out maintenance of Steel work of all girder bridges with clear span of 12.2m and above.	Yes/No	Para 201(3a) of IRBM
42	Whether date of painting of steel work is painted in white on the outside of the left girder of the first span.	Yes/No	Para 203(1) of IRBM
43	Whether Loss of camber in steel girders reported.	Yes/No	Para 212 of IRBM
44	Whether cracks in steel work detected.	Yes/No	Para 213 of IRBM
45	Whether steel work is checked for corrosion.	Yes/No	Para 216 of IRBM
46	Whether steel work is painted with two coats of ready mixed red oxide paint to IS : 123 or paint aluminium to IS : 2339 depending on the severity of corrosion.	Yes/No	Para 217 (2c) of IRBM
47	Whether entire steel work of a girder is painted at regular intervals which may vary from six years in arid zones to one year in highly corrosive areas.	Yes/No	Para 217 (5) of IRBM
48	Whether welded girders maintained for fatigue cracks developing in steel girders during service due to repeated loading.	Yes/No	Para 219 (1a) of IRBM
49	Whether location and length is marked distinctly with paint for easy identify-cation, if separation of concrete deck slab from the steel girder is noticed,	Yes/No	Para 220 (b) of IRBM
50	Whether SSE (Bridge) inspected the steel works in the Loco shed and workshop structures and any other light steel structures when specifically ordered by the CE CBE at such frequency as decided by the CBE.	Yes/No	Para 901(1) of IRBM

5.0 Maintenance Schedule of Steel structures

S. No.	Items for Maintenance	Periodicity	Ref.
1	Painting of steel work	Once in 5 to 7 years	IRWM-226 (b)
2	Steel columns of footings when buried in ground should be encased in cement concrete well above ground level. This is to be done in the case of foot over bridges, columns of platform shelters, water tank stagings, etc.	As and when required	
3	Maintenance of (valley gutters, vertical down take pipes of service buildings and platform covers) should be attended to ensure proper drainage.	Before commencement of monsoon	IRWM-226 (c)
4	Loss of camber in steel girders - Loss of camber can be mainly attributed to a) Overstressing of members beyond the elastic limit - to strengthen the girder with proper camber or replace the girder b) Overstressing of joint rivets - the joint redesigned and rivets and gusset plates replaced c) Loose rivets- - replaced by sound rivets	As and when required	IRBM-212
5	Cracks in steel works - A small hole of 7mm diameter should be drilled at the extremities of the crack to prevent its further propagation. - The cracked member may be strengthened by cover plate (s), adequately rivetted	As and when necessary	IRBM-213
6	Strengthening of weak girders a) Replacement of weak rivets by larger diameter rivets. b) Replacement/strengthening of floor system, namely, stringers and cross girders. c) Addition of flange/web plates to plate girders d) Strengthening of weak members of an open web girder	As and when necessary	IRBM-214
7	Replacement of loose rivets		IRBM-215
8	Corrosion and its prevention		IRBM-216
9	Protective Coatings by painting		IRBM-217

10	Metallising & Epoxy based Paints		IRBM-218
11	Maintenance of welded girders		IRBM-219
12	Painting of Girder Bridge - Floor system of girders etc. where corrosion is heavy, may require painting more frequently. Their periodicity should be as specified by the chief Engineer.	From six years in arid zones to one year in highly corrosive areas	
13	All sliding and roller & rocker bearings should be generally cleaned and greased	once in three years	IRBM-222(2)a)
14	Maintenance of Elastomeric bearings	periodic cleaning	IRBM-222(3)b)
15	Maintenance of Teflon or P.T.F.E. bearings	periodic cleaning	IRBM-222(4)c)
16	Maintenance of Bed Blocks due to - Improper seating of bearings - Shaken bed blocks - Cracking and crushing of masonry	-	IRBM-221(a), 221(b), 221(c)

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QUALITY POLICY

"We at RDSO Lucknow are committed to maintain and update transparent standards of services to develop safe, modern and cost effective railway technology complying with statutory and regulatory requirements, through excellence in research, designs and standards by setting quality objectives, commitment to satisfy applicable requirements and continual improvements of the quality management system to cater to growing needs, demand and expectations of passenger and freight traffic on the railways through periodic review of quality management systems to achieve continual improvement and customer appreciation. It is communicated and applied within the organization and making it available to all the relevant interested parties."

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To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

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अअमासं RDSO रेल अग्रदूत Transforming Railways

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यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें।

If you have any suggestion & comments on contents of the pamphlet, please write to: ***Joint Director (Civil), CAMTECH, Maharajpur, Gwalior (M.P) – 474 005***

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