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भारतीय मानक

त्रिज्य गेट और रज्जु ड्रम उच्चालकों के निरीक्षण, परीक्षण एवं रख-रखाव की सिफारिशों का भारतीय मानक मसौदा

भाग 3 लगाने के बाद

(पहला पुनरीक्षण)

Indian Standard

RECOMMENDATIONS FOR INSPECTION, TESTING AND MAINTENANCE OF RADIAL GATES AND ROPE DRUM HOISTS

PART 3 AFTER ERECTION

(First Revision)

UDC 621·422·23 : 621·876

BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 4

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Hydraulic Gates and Valves Sectional Committee had been approved by the River Valley Division Council.

Noting lack of adequate systematic information on procedures for inspection, testing and maintenance of radial gates and their hoists after erection, the Hydraulic Gates and Valves Sectional Committee decided that a set of recommendations on this subject be drawn up for reference and guidance of the personnel engaged in these duties. This standard has accordingly been prepared to provide guidelines for radial gates.

This standard is being published in parts. Part 1 deals with inspection testing and assembly at manufacturing stage. Part 2 deals with inspection, testing and assembly at the time of erection. Part 3 deals with inspection, testing and maintenance after erection.

This standard (Part 3) was first published in 1982. In this revision provision in respect of inspection has been further elaborated in detail.

For the purpose of deciding whether a particular requirement of the standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding of numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RECOMMENDATIONS FOR INSPECTION, TESTING AND MAINTENANCE OF RADIAL GATES AND ROPE DRUM HOISTS

PART 3 AFTER ERECTION

(First Revision)

1 SCOPE

This standard (Part 3) lays down the recommendations for inpection, testing and maintenance of radial gates and their rope drum hoists after erection.

2 REFERENCES

The Indian Standard listed below is a necessary adjunct to this standard:

IS No.	*Title*
7718 (Part 3) : 1975	Recommendation for inspec-, tion, testing and maintenance of fixed wheel and slide gates: Part 3 After erection

3 GENERAL

3.1 Drain holes in the horizontal girders and arms should be checked so that they do not get clogged with silt causing accumulation of water in the horizontal girders and arms.

3.2 Rope drums, pulleys and rope connection should be checked.

3.3 Functioning of the limit switches, interlocking devices, indication lamps, etc, should be checked for proper working.

3.4 The operating systems of the gate should be checked for their proper functioning.

3.5 Where stoplogs are provided upstream of radial gates, they should be maintained as per recommendations contained in IS 7718 (Part 3) : 1975.

4 INSPECTION

4.1 Periodical inspection of gate installations should be carried out to detect normal wear and tear, defects, if any. It should be done as and when necessary, but at least thrice in an year, one being prior to the onset of monsoon and one immediately after the mosoon and one at other times. The gates should be operated up and down several times to make sure that everything is in order.

4.2 Inspection work may consist of visual inspection of exposed surfaces of embedded parts, such as gate leaf, hoisting equipment, hoist supporting structures and checking of important dimensions. These include sill beams, wall plate consisting of seal, if any, trunnion girders and gate leaf. In cases of inaccessible parts, inspection may be necessary by other means like divers.

4.3 Inspection of Radial Gates

No pieces of equipment, however well designed and sturdy, will run efficiently unless it is well kept and maintained. Therefore the details of inspection to be done and the schedule of maintenance are given here.

4.3.1 *Periodical Inspection*

In order to detect normal wear and tear, defects, if any, periodical inspection of gate installation should be carried out. The periodical inspection of these gates and hoist should be done as and when necessary, but at least thrice a year and corresponding to the periods when the water level in the reservoir is at its highest and lowest levels. In short, premonsoon and post-monsoon inspections should be done and the following checks be exercised.

Points to be Inspected (1)	*Compliance* (2)
I. *Inspection of yoke girder thrust block trunnion assembly and anchorage.*	
1. Check the Nuts and bolts	
a) Below trunnion assembly	Check for proper functioning
b) Trunnion bracket to yoke girder	do
c) Nuts of horizontal and vertical anchorsage	Check for torque
d) Trunnion pin lock plates	Check tightness
e) Check shear key if provided behind the trunnion bracket	Check for cracks
f) Nuts of the main tie rods	Check for tightness and torque
2. Check the weld between yoke girder and main ties	For soundness
3. Check whether yoke girder and thrust block is covered so that water does not accumulate in the slots	Cover with 3 mm thick M.S. plates if not already covered
4. Check whether trunnion pin ends are covered with anticorrosive jelly	Cover it if not already covered
5. Check whether flexible sheath cover is provided to prevent entry of debris in the trunnion assembly	do
6. Check the welds of thrust block (with magnifying glass) (also ensure that the inside is concreted)	Check for cracks. Rectify accordingly
7. Check if the oval holes are free	Remove debris or other accumulated materials
8. Check grease in trunnion assembly	Take steps for greasing after removal of dirt, if any
9. Check to flexible cover	Replace if necessary and clean dirt from pin surface below the same
II. *End arms*	
1. Check welding joints of end to horizontal girder (with magnifying glass, preferably) on joints/stiffners)	Check for cracks : rectify accordingly
2. Check whether drain holes drilled in the end arm are clear at both ends.	Clear them if checked
3. Check nuts and bolts of end arms to horizontal girder joints	Check for tightness
III. *Horizontal girder*	
1. Check welding of	
a) Stiffners of horizontal girders	Check for crack and other defects and rectify accordingly
b) Horizontal girder to stiffeners of skin plate	do

Points to be Inspected (1)	*Compliance* (2)
c) Locking arrangement brackets of skin plates	Check for weld crack
d) Check drain holes of horizontal girder	Clear them if chocked and clean the debris accumulated regularly
IV. *Skin plate assembly and rubber seals*	
1. Check the following welding joints	Check for crack and other defects and rectify, if necessary
a) 'T' and skin plate and ribs	do
b) Vertical joints of skin plate from upstream side and down stream side	
c) Check lifting bracket and lifting pins for its soundness	
d) Latching brackets to skin plate	Check welding with a magnifying glass and rectify, if required
2. The skin plate should be observed for pitting, scaling and corrosion on upstream side	Sealing formation should be removed. Pitting should be filled with weld and grinded for finish. For corrosion clean it and apply paint
a) Check the condition of side and bottom rubber seal corner joint and observe leakage	If condition is poor replace same, check the cause of undue wear, also before replacement
b) All the nuts and bolts fixing rubber seal to skin plate	Check for wear and tear, tightness and replace, if required
c) Check if there is any undesirable material in between seal and stainless steel plate, seal and skin plate	Remove it (All rubbish should be periodically removed from the seal surface)
d) Check for deformation of seal	Study the cause of deformation and rectify it
e) Check soundness of cladding in case of cladded rubber seals	do
f) Check whether there is abnormal abrasion on seal seat	Study the cause of abrasion and rectify it
V. *Sill beam and wall plates*	
1. Check the following joints	
a) Wall plate to sill beam	Check for crack and other defects rectify
b) Two segments	Rectify the joints using proper welding rods and grid, as necessary
c) Stainless cladding to M. S. plate	do
2. Check wall plate and sill beam for pitting and rusting and general conditions	Pitting is to be filled in by welding. Rusted portion should be painted of tex cleaning
VI. *Guide roller*	
1. Check the roller for its movements and setting	Make the roller free if jammed clean and grease
2. Check the nuts and bolts and guide roller	Check for wear and tear and tightness

Points to be Inspected (1)	*Compliance* (2)
VII. *Latching arrangement*	
1. Check whether latching device functions well	Check the function by operating lever. Rectify the same if movement is not smooth
2. Check ropes, nuts and bolts and studs of locking devices	Replace ropes and tighten the bolts if required
VIII. *Wire ropes, hoist, pulleys, sheaves, etc*	
1. Check for following	
a) Check condition of wire rope	If the condition is poor, then replace the wire rope and if 10 percent broken wires are within the length of one meter and more than 20 percent broken wire within the length of 10 m, wire ropes should be replaced
b) Check pulley sheave assemblies and sockets	Check condition of pins and every year these should be removed, cleaned and refitted after lubrication
c) Check turn buckles	Check for rusting, jamming in the turn buckles, and check if the number of threads holding the rope are adequate
d) Check tension of wire ropes	Adjust both wire ropes for equal tension
e) Check if end of wire rope is properly fastened to drum	If found loose, tighten the studs provided for
f) Check for lubrication of wire ropes, if required	Lubricate ropes
IX. *Gear train assembly*	
1. Check for following	
a) Check condition of gear and pinions	Check uneven wear and contact adjust properly
b) Check position of gears and pinion	Bring them to correct position if found shifted to either side
c) Check shaft and couplings used for connecting drive unit and gear train	Visual inspection and coupling nuts to be checked
X. *Drive unit*	
1. Check for following	
a) Check condition and functioning of electro-magnetic brake	Replace worn out liner, adjust brake shoes carefully, so that both the shoes hold the drum when supply is cut off or both the shoes should move out simultaneously if switched on. Brake drum and liner should always be free from grease, oil etc
b) Check all electrical connection of hoist motor, brake, starter, limit switch etc. Also check remote control systems, if provided	Check for loose connection, proper insulation (rats and crabs damage the insulation). Overload relay of the starter is to be adjusted, for correct position and should not be disturbed

Points to be Inspected (1)	*Compliance* (2)
c) Check the connecting arrangement from adjacent motor	
d) Check condition of position indicator and all its accessories	Check for its proper function and rectify
e) Reduction gear box (worm reducer)	Check for smooth operation and check oil level
XI. *Check nuts and bolts of*	
1. Check for following	
a) Hoist frame b) Drive unit	Check for wear and tear and tightness
c) Gear boxes d) Flange coupling	Tighten if required or replace for undue wearing
e) Bearing housing f) Foundation bolts of hoist bridge	Inspect for cracks in housing and replace, if needed

4.3.2 *General* — Inspection to check that:

a) The gate operation should be trouble free and there should not be unusual sound.

b) On load (that is, when there is water) there should be no undue vibrations in the gate and the structure.

c) Observe the current drawn by motor at the time of lifting of gate. If any excessive current drawn is noticed, operation of hoist should be stopped immediately and reason for the same may be investigated for lubrication of various parts of gates and hoists and rectified.

d) Check the supply voltage.

e) Check the lubrication at various points.

f) Check the condition of painting at various parts.

5 TESTING

5.1 The gate should be tested for its travel up and down to see that it moves smoothly without excessive sway throughout the travel.

5.2 The operation should be trouble-free and there should not be any unusual sound. There should not be any undue pressure or extra efforts when the gate is operated under no load condition. Any extra current being taken by the motor should be taken note of.

5.3 On load (that is, when there is water) there should be no undue vibrations in the gate and structure during operation of the gate. In case vibrations are noticed, the positions of gate openings and water levels should be noted and the reasons thereof should be investigated.

5.4 Based on the inspection and testing, suitable remedial measures should be taken (*see* **6**).

5.5 Trouble Locating Chart

Trouble	*Probable Reasons*
1. Gate does not rise	1. No supply
	2. Obstruction in rubber seals
	3. Obstruction in guide rollers
	4. Fault in electric motor
	5. Fault in wiring
	6. Blown out fuse
	7. Brake shoes jammed
	8. Wire rope broken
	9. Malfunctioning of electrical contacts due to any reason
2. Gate vibrates or produces noise	1. Lack of lubrication in trunnion and guide rollers
	2. Rope length not identical on both sides
	3. Lack of lubrication or fault in wire rope pulley sheave arrangements

Trouble	*Probable Reasons*
3. Motor does not function	1. No supply 2. Starter not in order 3. Blown out fuses in switches 4. Low voltage 5. All fuses are not working
4. Starter not working	1. No supply to starter 2. Fixed and moving contacts not in order 3. Limit switch engaged
5. Unusual sound	Verify the spot and attend to the following 1. Mis-alignment of any particular component 2. Shearing of connecting bolts and nuts 3. Lack of lubrication 4. Entry of any extraneous matter into guide roller assembly or pulley sheaves or trunnion assembly

6 MAINTENANCE

6.1 The maintenance of radial gates and their hoists mechanism should be done regularly. Reference should be made to manufacturer's instructions for detailed maintenance and servicing of hoists. Proper record of inspection, testing and maintenance should be made by the project authorities.

6.2 The following maintenance works should be attended to:

a) Defective welded should be chipped out and it should be rewelded. Damaged nuts, bolts, rivets, screws, etc should be replaced. Any pitting should be filled up by welding and finished by grinding, if necessary.

b) The gate leaf, exposed embedded metal parts, hoists and hoist supporting structure, etc, should be thoroughly cleaned and repainted when required. While deciding about repainting, the original painting system adopted should be kept in view.

c) Trunion bearing should be greased wherever required. Keeping trunnion bearings in perfect working condition is very important. All other bolted connections should also be checked for proper tightness.

d) Bolts and trunnion bearing housing should be tightened wherever required.

e) The seals of the gate should be checked for wear and tear and deterioration. These should be adjusted/replaced, as and when necessary.

f) Wire ropes should be properly greased.

g) Oil level in the worm reduction unit should be maintained by suitable replenishment. Oil seals should also be replaced. if required. Lubrication of other parts of the hoists, such as chains in operating, position, indicators and limit switches should also be done.

h) The stroke of the brake should be reset to compensate for lining wear. Worn out brake linings should be replaced in time.

j) Flexible couplings should be adjusted, if required.

k) Repairs and replacement of electrical relays and controls should be attended to.

m) Maintenance of alternative sources of power, such as diesel generating sets and alternative drives wherever provided should be carried out.

n) The list of essential spare parts to be kept available should be reviewed and updated periodically. The availability of essential spare parts should be ensured. The condition of spares should be checked periodically and protective coating given before use.

p) Lubrication details:

1. Grease — Multipurpose
— Bearing grease

Applicable points:

1. Pulley sheaves
2. Pulley brackets
3. Guide rollers
4. Trunnion assembly
5. Rope drums
6. Line shaft bearings

7. Matching teeth of gear box assembly

Once before rainy season or as required

2. Cardium compound

Applicable points:

1. Wire ropes

Once in every season after cleaning of wire ropes or as required.

3. H. P. 90 Gear oil

Applicable points:

1. Reduction gear box

Level up the gear box before operation.

4. Mobil oil

Applicable points:

1. All rubbing surfaces and oiling points
2. At points located in brass/metal bushes

Carefully once/twice a year.

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