रेल खराब होने को कम करने के लिए रेल रखरखाव
Rail Maintenance to Reduce Rail Deterioration

1.0 परिचय / Introduction

To improve rail performance along with a decreased maintenance cost, by adopting efficient maintenance of rails results in increased service life of rails. Although maintenance instructions are available in manual, circulars, and in books nevertheless this document is intended to provide rail Maintenance practices so that these may be adopted uniformly by field staff.

2.0 रेल खराब होने के कारण / Causes of Rail Deterioration

The principal factors causing rail deterioration are detailed below:-

(1) Corrosion and Rusting

Corrosion is caused not so much by the dampness as by acid gases dissolved in the film of moisture, which frequently coats the rails. Corrosion is generally noticed on the web and foot of the rail. Corrosion is generally heavy in the following locations:-

(a) Platform lines where trains make prolonged halts.

(b) Sidings where saline or corrosive goods are dealt with.

(c) Near water hydrants due to insufficient drainage.

(d) Tunnels and deep cuttings.

(e) Areas near the seacoast

(f) Industrial belts

(2) Wear on Rail Table

The wear of top table increases with higher traffic density as in suburban section, though not proportionately.

(3) Flattening of Rail Table

This mostly occurs on the inner rail of a curve because of higher contact stresses due to heavy axle loads, large un-sprung mass or under equilibrium speed on canted track, which causes slipping of wheel sets. Flattening of rail table is an indication of overloading on inner rail; and this tendency can be reduced, if appropriate cant is provided.

(4) Wear on Gauge Face

The outer rail of a curve has to withstand heavy pressure from the wheels, which results in the running edge becoming worn or ‘side-cut’. Wear on gauge face is especially pronounced in case of suburban sections where rolling stocks are provided with laterally un-sprung traction motors.

(5) Hogging of Rail end

A hogged rail is one with its end or ends bent in vertical direction. A hogged rail end in the track is ascertained by un-fishing the joints, removing the fastenings and then measuring the extent of hog at the rail end by placing

a 1 meter long straight edge over the rail table, centrally over the joint.

(6) Battering of Rail ends



Rail end batter occurs where the joint gaps are excessive. It is caused by the impact of wheels on end of a rail particularly if the fishplates do fit snugly. Rail end batter is measured as the difference in heights of the rail at its end and at a point 30 cm away from the rail end.

(7) Wheel Burns



Wheel slipping occurs usually on adverse gradients or while starting on rising grades when considerable heat is generated and top of the rail is torn off in patches, causing depressions known as wheel burns, from which cracks may develop. This also occurs when train brakes are suddenly and wheels lock and slide, or due to under-powering of trains. Wheel burns cause the wheels to hammer the rails and lead to difficulties in keeping the sleepers packed firmly and fastenings tight. Such rail should be kept under observation and changed the affected length, in case repair by welding is not feasible.

(8) Corrugation



In certain locations, rail table develops ridges and hollows called corrugation and when vehicles pass over these rails, a roaring sound ensues. Such rails are called “roaring rails”. In such locations, excessive vibrations are caused, due to which fastenings and packing tend to get loose and track needs frequent attention.

3.0 सावधानियां और रखरखाव / Precautions and Maintenance

Efficient maintenance of rails results in increased service life of rails. The following precautions/maintenance practices, if observed, will effectively reduce rail deterioration.

(1) सामान्य / General

(a) Ensure that corrosion of rail is controlled by various measures such as greasing of liner seat, painting of liner seat & weld collars, shifting of liners seats etc.

(b) Rail flanges / web should be kept free of the muck particularly at stations.

(c) Periodical cleaning of rubbish should be done in goods shed siding lines.

(d) Train watering arrangements / Water columns should

be avoided on the run through main lines as far as possible. Proper drainage should be ensured inward/station lines including washing lines, washable aprons, train watering lines etc.

(d) Ensure 100% complete and tight track fastenings and earth bonds.

(f) Ensure rail foot is away from stagnated water and ballast.

(2) Prevention of Corrosion

For identification, measurement and preventive measures to reduce corrosion following method may be adopted uniformly.

A. Identification for Corrosion Prone Location

The areas may be classified in in two groups based on corrosion proneness as defined below:-

(a) Severe Corrosion Prone Location

The section where rate of liner seat corrosion recorded is more than 3 mm in 3 years.

(b) Moderate Corrosion Prone Location

All sections where rate of liner seat corrosion recorded is between 1 mm and 3 mm in 3 years.

B. Measurement

(a) A pointer tip tool device is suitable to measure the corrosion. This device can be able to read accurately fixed in graduated scale. Image of instrument which may be used is given here.



(b) Measurement of corrosion pits shall be done once in a year on every 100 sleepers by removing Elastic Rail Clips and liners.

C. Anti-corrosive Painting

Ensure anti-corrosive treatment is given to all parts of fastening of rails, prone to corrosion.

(a) Painting of Rails

I. Painting Scheme

In identified corrosion prone areas, rails that are already laid in track, anticorrosive bituminous coating to rails should be given in the track itself. New rails which are to be laid during track renewal / doublings / other construction projects, anti-corrosive bituminous coating should be provided before laying in track.



II. Procedure

Surface preparation of rails shall be done, with the help of hand operated or power operated tools i.e. scrappers, wire brushes, sand paper, pumice stones etc. Wire brushing shall invariably be done at the end so as to obtain uniform rubbed surface.

Surface prepared shall be checked visually for uniformity of surface. Special care should be taken in surface preparation at weld collars and liner contact areas. Surface preparation should not be done when ambient temperature is below 10°C or above 50°C, in rainy season, during night, in winter before 8 AM, in summer between 11 AM to 3 PM and in extremely windy / misty / dusty conditions. Chemical should not be used for surface preparation. Painting should be done in two coats of thickness of 100 microns each by anti-corrosive bituminous black paint confirms to IS: 9862 after an interval of 8 hours between two coats. All the liners and Elastic Rail Clips shall also be painted with anti-corrosive black bituminous paint after duly cleaning the surface.

III. Periodicity of Painting during Laying and Maintenance

Painting of rails shall invariably be done at the time of initial laying of rails. Painting of rails during maintenance shall include painting of welds both Thermit and FBW as per periodicity given below:-

i) In severe corrosion prone locations - Bituminous painting on inside and outside of the rails shall be done in a year.

ii) In moderate corrosion prone locations - Bituminous painting of rails shall be done once in a year on inside of gauge face including web and foot and once in three years on non gauge face side of rail including web and foot.

iii) In other areas, wherever signs of corrosion are seen in isolated patches, prompt action for anti-corrosive painting shall be taken.

(b) Painting of Thermit Welds

I. Painting of Thermit welds over the weld collar and 100 mm on either side shall be done immediately after welding. Painting of flash butt welds will get automatically covered along with the painting of rails at the time of initial laying.

In service painting (maintenance painting) of Thermit welds should be carried as per following frequency:-

i) Once in four years in areas not prone to corrosion.

ii) Every year at locations prone to corrosion.

iii) The frequency may be increased depending on the site conditions.

iv) On condition basis at location which are prone to severe corrosion.

II. Procedure for Painting of Weld Collar for Thermit Welded Rail Joint to Protect Against Normal Corrosion

A. New Welded Joint

1.0 Surface Preparation

1.1 Remove dust, loose rust and mill scale by wire brushing.

1.2 Scrub welded area with water to make it free from slag and other water soluble compounds. Make it dry.

2. Painting Procedure

2.1 Apply one coat of ready mixed paint, brushing, bituminous black, lead free, acid, alkali , water and chlorine resisting ,conforming to IS: 9862-1981 on the welded area and 10cm on either side.

2.2 After eight hours drying , apply a second coat of the same paint.

2.3 Painting should be carried out by brush only.

B. Maintenance Painting (For old Painted Joints)

1. Surface Preparation

1.1 Remove dust, dirt and flaked paint from the welded joint by wire brushing.

1.2 Degrease the surface by petroleum hydrocarbon or any other suitable solvent, if oil or grease is present. Allow it to dry.

2. Painting Procedure

2.1 Apply one coat of ready mixed paint, brushing bituminous black, lead free, acid , alkali and chlorine resistant to IS:9862-1981 or bituminous emulsion to IRS: P-30-1996 on welded area and 10 cm on either side.

2.2 If required, a second coat of the same paint may be applied after a minimum of eight hours drying.

2.3 Painting should be carried out by brush.

3. The list of approved manufactures for the above quality of paints is issued every year by the Director General (M&C), RDSO, Lucknow to Zonal Railways.

III. Procedure for Painting of Weld Collar for Thermit Welded Rail Joint to Protect Against Severe Corrosion

A. New Welded Joints

1. Surface Preparation

1.1 Remove dust, loose rust and mill scale by wire brushing.

1.2 Scrub welded area with water to make it free from slag and other water soluble compounds. Make it dry.

2. Painting Procedure

2.1 Apply one coat of high build epoxy paint (two pack) conforming to RDSO specification No. M&C/PCN-111/88 on the welded area up to 10 cm on either side.

B. Maintenance Painting (For old Painted Joints)

1. Surface Preparation

1.1 Remove dust, dirt and flaked paint from the welded joint by wire brushing.

1.2 Degrease the surface by petroleum hydrocarbon or any other suitable solvent, if oil or grease is present. Allow it to dry.

2. Painting Procedure

2.1 Apply one coat of high build epoxy paint (two pack) conforming to RDSO specification no. M&C/PCN-111/88 on the welded area up to 10 cm on either side.

3. RDSO specification no. M&C/PCN-111/88 has been circulated vide RDSO's letter no. M&C/PCN/II/TR/3 dt: 13/14-5-1991

NOTE:-

1. The epoxy based paint recommended is a two pack system with a pot life of around five hours. Hence prepare only that much quantity of paint which can be consumed in less than five hours.

2. The paint should be procured along with the thinner recommended by the manufacturer of the paint. No other thinner i. e. kerosene oil, etc should be used.

(c) Epoxy Painting on Liner Bite Area

I. The epoxy painting with anti-corrosive paints of RDSO suggested firms shall be applied on the affected area and 10 cm on either side. The list of approved manufacturers for epoxy painting is issued every year by Director General (M & C) RDSO.

II. It may be noted that the epoxy paint to be applied only on location of problem areas, such as in case of corrosion due to liner biting, the paint to be applied on liner & rail flange area in contact and 10 cm on either side.

III. The performance of the anti-corrosive paint shall be kept in record to work out the effectiveness of a particular paint for prevention of corrosion.

D. Lubrication and Greasing

Greasing shall not be done in rainy condition and hot weather conditions.

(a) Greasing and Sealing of Liner Contact Area

In identified corrosion prone areas, the rail liner seat should be greased using graphite grease IS-408-1981 Gr. O specification after proper cleaning. The grease is also applied all around the liner on the rail foot on gauge face side to prevent the ingress of toilet droppings in the gap between the liner and



the rail foot. Greasing and sealing of liners contact area shall be done at the time of initial laying, along with TFR/ de-stressing and during maintenance once in year for gauge face side and once in two years on non-gauge face side of rail.

(b) Reducing Side Wear on Gauge Face of Outer Rails

I. The wear on the outer rail on the curve can be reduced effectively by-

i) Lubricating the gauge face of outer rails on the curves.

ii) Maintaining correct curve geometry and Super-elevation.

iii) Provision of suitable checkrail.

iv) Adopting slack gauge PSC sleeper as per RDSO drawings depending on curvature of track.

II. Track mounted automatic Gauge Face Lubricators should be provided on curves of radius 875 m (2°) and sharper to reduce rail gauge face wear.

III. On routes where rail grinding is in practice, track mounted automatic Gauge Face lubricators should be provided on curves of radius 1400 m (1.25°) and sharper.

IV. Lubrication should be done on new rails or on old rails, which do not have Gauge Corner Cracking or head checks.

V. It is also advisable to use grease on straight track at location of rail wear caused due to sinusoidal movement to curb against sinusoidal wear in straight track.

(c) Lubrication of ERC Clips

I. To prevent corrosion and seizure of ERC with MCI insert, regular greasing and oiling of ERCs should be done.

II. Frequency of lubrication of ERCs and inserts at the time of initial Laying should be done 100% and thereafter following schedule is prescribed.

- In corrosion prone areas & platform lines: Once in a year.
- In other areas: Once in 2 years.
- Material: Graphite Grease (Gr.0) of IS-408-1981.

(d) Lubrication at Point and Crossings

I. Greasing of gauge face of tongue rails, lead rail on T/outs, outer rail of turn-in-curve and emergency cross-over should be carried out once a week.

II. Cleaning and Lubrication of points– At all interlocked and partially interlocked stations, the Signal staff will be responsible for the periodical cleaning and lubrication of all slide chairs in all points interlocked with signals or provided with locks. On slide chairs of all hand Operated points keyman shall do cleaning and lubrication.

III. In addition to above, oiling of brackets and lugs should also be done simultaneously, as contact area of these members with stretcher bar is getting corroded resulting in thickness of stretcher bar bolts reduced and get jammed.

(e) Ensure oiling and greasing including re-tightening/ renewal of fittings of SEJ, once a fortnight by Keyman.

(f) Ensure lubrication of fish plated rail joints to retard wear on the fishing planes of the rails and fish plate once a year.

(f) Lubrication of Plate Screws and Rail Screws

Lubrication of The Plate Screws & Rail Screws provided on PSC sleepers on Turnouts, Switch Expansion Joints, Bridge guard rails & Level crossings should be done with Grease graphite IS: 408, Grade '0' as per frequency below:-

I. At new Turnout/SEJ/Bridge guard rail/Level crossing/ renewal sites, the greasing of new Plate/Rail Screws should be done while providing in the track.

II. Once a year in areas not prone to corrosion.

III. Once in six months in corrosion prone areas.

E. Shifting of Corroded Liner Seats

By shifting of rail from its position, the reduced foot section due to corrosion gets shifted away from the liner. Thus, its further reduction in foot thickness at same location due to corrosion gets eliminated and new location with normal thickness comes under the liner. Thus, the reduction of foot thickness at one location gets stopped. This can be done in following two ways.

I. Longitudinal Shifting of the Rail

i) In longitudinal shifting the corrosion affected portion is shifted between the sleepers. This shall preferably be done when reduction in thickness of rail at the bottom flange is less than or equal to 1.5 mm. This shifting of liner seats may be done by 150 mm systematically along with de-stressing of rails in LWR track and pulling back rails in SWR/fish-plated track once in every 3 years in moderate corrosion prone locations and once in every 2 years in severe corrosion prone locations or before corrosion pit depth at liner contact area reaches a limit of 1.5 mm, whichever is earlier.



ii) During the process of distressing cutting and removing the rails for length of 150 mm or in multiples of sleepers spacing +150 mm so as to ensure shifting of liner seat by 150 mm uniform at all locations.

iii) In any case, efforts should be made to ensure that corrosion at liner contact area is not allowed to exceed a limit of 1.5 mm at any point of time.

II. Interchanging of Rails

i) Interchanging of rails may be done when shifting of liner seat from all sleepers is not practical i.e. where shifting of liner seat will not result in all liner seat to be away from the sleepers such as locations where sleeper density was increased and location where liner seat got shifted non-uniformly during casual renewal, de-stressing, TWR etc.

ii) Interchanging of rail will result into making the gauge face as non gauge face which will result into increase in life of rail as the reduction of foot thickness at same location will get stopped. This is to be done when the rail is relatively new and reduction in rail foot area is less, i.e. reduction in rail foot is less than 1.5 mm.

***

हमारा उद्देश्य / OUR OBJECTIVE

To upgrade maintenance technologies and methodologies and achieve improvements in productivity and performance of all railway assets and manpower which inter alia would cover reliability, availability for use, utilisation and efficiency.

DISCLAIMER

The information contained in this pamphlet does not supersede any existing provisions laid down in RDSO & Railway Board instructions. This document is not statutory & instructions given in it are for the purpose of guidance only.

भारत सरकार - GOVERNMENT OF INDIA
रेल मंत्रालय - MINISTRY OF RAILWAYS

(केवल कार्यालय उपयोग हेतु / For Official use only)
(An ISO: 9001-2015 Certified Organization)

रेल खराब होने को कम करने के लिए रेल रखरखाव
Rail Maintenance to Reduce Rail Deterioration



CAMTECH/C/2020-21/RMRRD/1.0
MAR - 2021

Indian Railways
Centre for Advanced Maintenance Technology
महाराजपुर, ग्वालियर - 475005
Maharajpur, Gwalior – 474005
Telephone : 0751-2470869, Fax : 0751-2470841
E-mail :dircivilcamtech@gmail.com