

NORTH EASTERN RAILWAY

CE'S P.WAY CIRCULAR NO.46 OF 1965 (REVISED)

'TRACK MAINTENANCE'

(This Circular superseeds Circular No.22 of 1965 and 42 of 1964).

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1.1 This circular contains instructions on the annual systematic track maintenance including what is commonly known as overhauling of track during certain period of the year. Wherever possible, the relevant instructions from the Indian Railways Way & Works Manual have been quoted. This circular superseeds previous circular No.22 of 1955 and 42 of 1964. Instructions regarding maintenance of short welded panels and installation and maintenance of Long Welded Rails have also been incorporated in this circular.

1.2 For convenience of reference, this Circular has been divided into two parts, Part I deals with the 'Instructions on Maintenance of Ordinary Fish-plated Track' and 'Instructions for Maintenance of Welded Track' have been given in Part II.

PART I.

2. The working season for systematic track maintenance commences in the post monsoon period beginning from about 15th of October. The annual programme for regular track maintenance shall be as laid down in Annexure I.

3.1 Over hauling (First turnover from 15th. Oct: to 15th. February)

3.1.1. The railway track is similar to a machine requiring periodical overhauling if it is to produce smooth running. Proper attention to overhauling is well repaid as it will produce an elastic track for the whole year. The following preliminary arrangements should be made.

3.1.1.(a) P.W.Is will ensure that the necessary track tools are in good condition and required track materials are arranged before the actual overhauling is taken in hand. They will submit indents for grease graphi to "track tools and materials well in advance so that the indents are compiled by Stores Department in time. The PWIs will personally check all tools with the gangs in the month of September and must replace all worn out tools before overhauling. A workman works best with proper tools. Similarly a gang will produce proper tools. Similarly a gang will produce proper quantum of work if its tools are in order and in sufficient numbers as per actual requirement.

3.1.1.(b) The gauge with each gang should be checked by stool tape. In case of variation, the difference should be painted on the gauge, but action taken to replace it at the first opportunity. Spirit levels and level boards should be checked personally by the P.W.I. and defects rectified. To avoid variation in cross levels due to defective spirit level or level board or both, a distinguishing mark should be stencilled one side of the level board and the spirit level. The level board and the spirit level should invariably be used with the stencilled marks on the right hand side facing towards the direction of increasing kilometreage. This should, however, not be allowed indefinitely. The level should be correct or replaced as early as possible.

3.1.1.(c) Croop, wherever beyond permissible limits should be adjusted and all joints made square before annual overhauling. This will enable proper squaring and spacing of sleepers during overhauling.

3.1.1.(d) Removal of high cess should be completed at the close of the rainy season when the cess is soft for easy cutting and has still some moisture for the grass to grow on the cess. It should be ensured that cess is maintained at the correct level below rail. Making up the cess should only be undertaken when the depth of cess below rail level

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exceeds 20"/22"/24" for track with 6"/8"/10" cushion, respectively. (It should be noted that cess below rail level should be 16" 18" 20" for 6", 8", 10" cushion, respectively, just near the toe of ballast section, a slope of 1' away from toe of ballast being desirable on cess).

3.1.1.(e) Overhauling of station yards excluding the through line and points and crossings on through line should be completed from 1st. Oct. to 15th Oct. before the annual opening out. This will free the gangs to devote more attention to track between the station. Where gangs are provided exclusively for the yards, they should commence overhauling only from 15th. October. .

3.1.1.(f) Sample of standard section of track:

At or about the commencement of each gang length between stations, a sample of two rail lengths of track shall be maintained to accord with all standards laid down i.e.,

- (i) Formation of standard width and level below rail.
- (ii) Clean ballast of correct size, quantity and cross section.
- (iii) Alignment, levels and gauge to correctness.
- (iv) Sleepers and fastenings in proper order.

The object of the sample track is to indicate the ideal standard to which the track should be maintained throughout each gang length.

3.1.1.(g) Sufficient number of tarred plugs should be in ready stock, in case of wooden sleepers track for issue to gangs before overhauling. In order to ensure that these plugs increase the life of the wooden sleepers, it is necessary to remove the damage and rotten fibres in the periphery of the existing spike holes. To achieve this the existing hole should be enlarged by drilling with a 19mm. ($3/4$ ") dia auger. This enlarged hole should then be plugged by tapered plugs, circular in section, according to the sketch given below:

TAPERED PLUGS FOR WOODEN SLEEPERS:

It is most unworkman like to observe Keymen regauging track during overhauling using thin chips of wood or respiking with the old spike holes not closed with tarred plugs.

3.1.2 LENGTH OF TRACK TO BE OPENED:

3.1.2(a) The length of the road to be opened and for the period it will remain upon depends on:-

(i) Variation in temperature.

(ii) Sufficiency of ballast.

(iii) Creep.

Normally not more than 100 metres should be opened in case of track with ordinary fishplated joints or laid with short welded panels.

3.1.2.(b) The length of track opened out each day should be finally packed and boxed the same day before the gangs leave the site of work.

3.1.2(c) To avoid danger of creep causing buckles specially on curves, the ballast should be stacked against the ends of the sleepers to prevent lateral movement.

3.1.2(d) Opening out should be commenced from the 15th of October and from the end of each gang. length opposite to that from which the previous season's opening commenced. In odd years the direction of opening will be in the direction of increasing kilometrage and in the even years it will be in the opposite direction.

3.1.2(e) It is necessary that the gangs should spend only one day a week for attending to and picking up slacks or other miscellaneous needs and the rest of the time should be devoted to overhauling. The gangs should be given rest only on Saturdays or Sundays ensuring that two adjacent gangs are not given rest on the same day.

In order that the minimum of 5 days per week for overhauling can be attained, gangs should do an intensive run of their beats and pick up slacks before the commencement of overhauling. However, all defects which are likely to endanger safety, and are noticed during inspections of officers and staff, must be attended to as a first priority.

3.1.2(f) A NORMAL DAY'S WORK WILL BE:

Morning: Opening out ballast, examination of rails, sleepers and fittings, squaring of sleepers, slewing of track to correct alignment, gauging and first packing.

Afternoon: Final packing of track opened in the morning, repacking of joint sleepers, boxing of ballast section and tidying, minor cess repairs and collection of scattered ballast and putting it in the track.

3.1.3 The sequence of operation will be as mentioned in para 622 of the Indian Railways Way & Works Manual. In addition to the instructions contained in para 622, the following subsidiary instructions should be observed.

3.1.3(a) OPENING OF THE ROAD:

The ballast must first be drawn out from the shoulders to a depth of 2" below the bottom of the sleepers at the sleeper ends, sloping down to a depth of 5" below the level of the bottom of the sleepers at the toe of the ballast section. The ballast between the sleepers should, then, be drawn out to a depth of 2" below bottom of sleepers at the centre sloping down to a depth of 5" below the level of the bottom of the sleepers at the toe of the ballast section. To ensure this, the following procedure should be adopted:

(I) Firstly, remove ballast lying outside the line of the ends of the sleepers, quite clear of the toe of the ballast section. Having out of ballast should be done with phowrahs as their use ensures that dirt is removed with the ballast.

(II) Secondly, rake away the ballast outside the rails from in between the sleepers and then remove the entire ballast between the rails and

place this ballast at the ends of the sleepers to form ballast support to the sleeper ends. The bed between the sleepers should then be cleaned with ohowrahs, as required.

Where the amount of earth mixed with ballast is substantial, use of wireclaws manufactured out of G.I. Wire (see sketch in Annexure VII) will be helpful.

3.1.3(b) EXAMINATION OF RAILS SLEEPERS AND FASTENINGS:

(i) Detailed instructions for casual renewal of sleepers and determining the number of sleepers required for renewals in the next year are given in CE's Circular No. 48 of 1965 on casual renewal of sleepers (under issue).

(ii) Casual renewal of existing R.B.S. rails will be necessary only where rails have become old or are seriously pitted. When such renewals are necessary a small continuous strength of existing rails should be utilised replaced by new Rails. Rails so released should be for scattered renewal in the remaining section.

(iii) In the case of casual renewal of non-standard rail sections which are not being rolled at all at present spot renewal should be carried out with good released rails of similar section, if available in station yards. If good rails of similar section are not available in station yards released rails obtained by relaying with standard rail section of one continuous strength of non-standard section should be used but such renewals should be minimised as much as possible and as per the actual requirements of the released rails for spot renewal elsewhere.

(iv) In case of CST-9 sleepers, Cotters, Keys, and Tie bars should be cleaned of all dirt to ensure proper adjustments and to prevent their getting seized due to formation of rust.

3.1.3.(c) SQUARING OF SLEEPERS:

(i) The sleeper spacing should be marked on the rail foot by the Gang Mate as per the sleepers spacing templates. The sleeper spacing should be carried out as per CE's Plan Nos. P/8/64 and P/9/64 (these have already been issued as enclosures to CE's circular No. 42 of 1964 and should be taken out and filed, as Annexure II & III at the end of this circular).

(ii) Major respacing of sleepers should not be carried out except along with relaying, resleepering, increasing sleeper density, deep screening or provision of additional ballast cushion. Where necessity of major spacing of sleepers is felt, even at the time of overhauling, specific orders of Deputy Chief Engineer should be obtained as it would involve sanction of additional labour.

3.1.3(d) SLEWING OF TRACK TO CORRECT ALIGNMENT AND GAUGING:

(i) Where the alignment is distorted, a preliminary slewing should be carried out in a continuous strength for the distorted track as it is not possible to obtain correct alignment if slewing is done in bits every day. Minor slewing of the track can be done daily for the track opened out where heavy slewing is not required.

(ii) In case of CST-9 sleepers and steel trough sleepers, slowing, which would generally be of a small order for normal maintenance, should be done after opening out the road, loosening and drawing ballast at the ends of the sleepers. The should not be disturbed if slewing is not required.

(iii) On straights only one rails should be sighted. The defective alignment of the other rail should be rectified by gauging. The Mates usually prefer to align the track in the evening after packing the track. This should be prohibited as slowing a packed track would disturb the packing & and require further packing. The disturbed track has also a tendency to spring back to its original position.

(iv) As Keymen have to perform their daily inspections of their beats, they are not easily available for gauging. In this case, the Mate should utilize the senior most gangman for gauging. Under no circumstances should gauging be done the next day. During gauging all old spike holes in wooden sleepers must be plugged with tarred wooden plugs (see para 3.1.1.(g) above). There is no advantage of regauging track, unless it is seriously out from the standard gauge, provided the gauge is uniform and is within the limits laid down in para 622(3)(iv) of the I.R.W.W.M.

3.1.3(c) PACKING OF SLEEPERS:

(i) For stone ballast track, it is best to select smaller size stones of $\frac{1}{4}$ "-1" gauge for packing under rail seats. The practice of packing with large-sized stones should be discouraged. Where the ballast consists of mixture of stone, kanker and brick, packing should be done with stone ballast as far as possible.

(ii) Due to smaller gauge of metre-gauge tracks, the track has a tendency to become centrebound in continuous stretches with produces rolling. The ballast at the centre of sleepers should, therefore, invariably be loosened up with the pick end of beater before commencing packing of rail seats.

(iii) In the case of CST 9 sleepers it should be ensured that the end pockets or bowls are filled with ballast and the main packing should be done at ends and corners. The central flat portion of the plate should not be packed hard but only tamped lightly.

(iv) In packing plate sleepers, four men are required per sleeper, two for each plate. They shall commence work under the rail and work outward to the required extent, striking evenly and simultaneously to ensure that the plate is uniformly lifted while packing.

3.1.3(f) BOXING OF BALLAST SECTION
AND TIDYING:

(i) The ballast should be raked in with the ballast rakes so as to be free from dirt. The ballast section should be formed with a ballast template and the deficiencies in ballast should be shown in the centre of track and noted in the form E.

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(ii) The ballast should be dressed flush with the top of the sleepers except for wooden sleepers track within station limits and half a mile outside the outer signals where the top of the wooden sleepers between rails will be protected by ballast from live cinders dropped from engines.

(iii) Boxing ballast section in the case of cast iron sleepers, care should be taken not to leave exposed the central portion of the tie bar.

Where there is a change in type of sleeper special precautions are to be taken and both types fully boxed for six rail lengths as for cast iron sleepers.

The top width of ballast section on straight for ordinary fisholated shall be:-

M.G. .. 7'-6"

B.G. .. 11'-0"

The top lines of the ballast section from end to end shall be the top of wooden and steel sleepers. In case of C.I. sleepers the line will be upto tie bar level inside the track and the shoulders raised upto the top fishing angle of rails.

On the outside of the curves, the width of the outer shoulder, i.e., the distance from the end of the sleepers to the outside corner of the top line of the ballast section should be increased by 6" more than that for straight track.

The slopes of the ballast section on bank or cutting without ballast wall should be 1 to 1.

Drainage may be obtained on the single or double line by providing a cross-fall of 1 in 40 from the centre of formation towards the cess. On curves the formation should be made up according to the track profile, no extra ballast being used for the purpose of superelevation.

3.1.3(g) The overhauling of level crossings should receive special attention and should be done in accordance with para 1611 (a) & (b) of the Indian Railways Way and Works Manual. Before covering up and taking up road surface, the P.W.I. must inspect the condition of the track. At busy level crossings, the opening of track should be done after due notice to road authorities, and an official of the atleast an rank of APWI should be present throughout the operation.

The date of opening should be recorded on the Gate Post.

3.1.3(b) The daily out-turn of overhauling should not less than 10 sleepers for M+3 sleepers density and 12 sleepers for M+6 sleeper density per gangman per day for trunk and main lines respectively and 12 sleepers for gangman per day for branch lines, tertiary lines or station yard lines. In order to complete the overhauling work in a period of four months from 15th October to 15th February, two extramen should be sanctioned to each gang over and above the gang strength calculated by modified Maflin's formula. These extramen must be discharged on 15th February.

3.2 LUBRICATION OF RAIL JOINTS (15TH.FEB.TO 15TH. MARCH).

3.2.1 The lubrication of rail joints should be undertaken, in accordance with instructions contained in CE's P.Way Circular No.44 of 1965 (Revised 1965) and completed from 15th February to 15th March.

3.2.2 In case the work of lubrication is undertaken by the keyman, assisted by a senior Gangman, only the keyman and a senior gangman will be engaged on this work for about a period of one month and the rest of the gang will be free to do the work of points and crossings as per para 3.4. During this period a senior gangman may be deputed to undertake the ganging.

3.2.3 Where the work of lubrication is done by connecting these gangs under the supervision of APWI or a Section Mate, the gang will be busy only for 9 days time and in the rest of the period they should do the work on points and crossings as given in para 3.3 below.

3.3 POINTS & CROSSINGS: (15TH.FEB.TO 15TH.MARCH)

3.3.1 The points and crossings should be attended in accordance with the programme drawn out as laid down in CE's circular No.S20 of 1961 and work carried out during 15th February and 15th March when the gang has completed the lubrication of joints.

3.3.2 The work should be done in accordance with para 632 of I.R.W.W.Manual supplemented by CE's circular No.20 of 1961 and CE's circular No.31 of 1962.

3.4 THROUGH PACKING:(second turnover from 15th.March to 15th June)

3.4.1 After completing overhauling, in accordance with para 3.1, one through packing should be given to the entire length in accordance with para 622 of the I.R.W.W.Manual.

3.4.2 OPENING OF ROAD:

Ballast should be opened out on either side of the rail- seats to the extents shown hereunder to a depth of 2" below the packing surface without disturbing the cores under the sleepers:-

- (i) B.G.- End of sleeper to 18" inside of the rail-seat;
- (ii) M.G.- End of sleeper to 14" inside of the rail seat:

In the case of C.I. plate sleepers, the opening out should be to the extent of the plates to enable packing being done conveniently.

The ballast should be drawn by shovels or powrahs outwards and inwards, i.e., the portion of the ballast on the outside of the rail should

be drawn outwards, the portions between the rails being drawn towards the centre. Care, however, shall be taken that the ridge of ballast formed between the rails does not project more than 2" above rail level.

3.4.3 The daily out-turn of through packing should not be less than 16 sleepers, for N+3 sleepers density, and 19 sleepers for N+6 sleepers density, per gangman per day for trunk and main lines, respectively, and 20 sleepers per gangman per day for branch lines, tertiary lines or station yard lines. At this rate it should be possible to complete the second turnover of through packing in three months time without engaging extra labour over and above the gang strength worked out according to modified Maflin's formula.

3.4.4 Through packing should be done for 5 days per week during 15th March to 15th April and 4 days per week during 15th April to 15th June. (See programme in Annexure 1).

3.5 ATTENTION TO DRAINAGE: (15th April to 15th June.)

3.5.1 The drainage of track between stations and in the station yards should be ensured by clearing of side and catch water drains and by repairs to the same whenever required. The pucca drain along the platform wall should be provided only where there is piped water supply.

3.5.2 Instructions laid down in paras 635 and 636 of the I.R.W.W. Manual in this respect must be carefully followed.

3.5.2 The drainage in the station yards should be provided in accordance with the CE's tentative plan Nos. CE/P/110/64 dated 26.11.64 and CE/P/111/64 dated 30.11.64 (copies enclosed as Annexure IV & V). The pucca drain along the platform walls is indicated in the above sketch, should be provided only where piped water supply is available.

3.6 PETROLLING ARRANGEMENTS:

All pre-monsoon precautions as per standing instructions should be taken.

All preliminaries, such as erection of Watchmen's and Patrolmen's huts at suitable predetermined locations, recoupment of flood reserve equipment, recoupment of pitching reserve stock, painting of flood gauges, stabling of wagons filled with cinders or boulders, etc. for use in emergency etc. should be completed well in time. In this connection chapter X, XI, XIV and SVII of I.R.W.W. along with subsidiary instructions to these chapters issued by Chief Engineer, N.E. Railway should be carefully followed.

3.7 PACKING UP OF SLACKS:

3.7.1 Picking up of slacks mostly consists of attending to low joints or to a difference in cross levels. The correct method of rectifying the low joints or difference in cross levels is described below:-

3.7.1(a) The track should first of all be aligned by Mate by sighting the rail from a distance of 30 to 60 metres. The slewing, if

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any, should be done by planting crow bar well into the ballast at an angle of not more than 30° to the vertical and levering both the rails of the track simultaneously in the direction of slew. If the sleepers are CST 9 or steel trough sleepers. Slewing should be done only after picking the cores to permit space for the sleeper to move without the sleeper rising.

3.7.1(b) The base rail should then be sighted by the Mate with the eye along the edge of the rail and chalk mark made on the sleepers requiring lifting.

3.7.1(d) Three sleepers on either side of the low joints should be opened out to the extent prescribed for through packing and the dip or low joints lifted correctly and packed keeping in view that if the lift is heavy, it should be done in stages. This having been done,

the other rail should be brought in level to the base rail by using levelling board and spirit level. The packing should be done in the same manner as for through packing.

3.7.9 Picking up of slacks should also be done one day (Wednesday) every week during the period of overhauling/through packing from 15th October to 15th February and from 15th March to 15th June. Refer to para 3.2.2(e) above in this connection.

3.7.3 During the period of lubrication of rail joints undertaken by collecting gangs under the supervision of an APWI or a Section Mate, and also during the period of attention to points and crossings, two-days in a week should be utilised for picking up slacks.

3.7.4 Picking up slacks must only be done on Wednesday if it is only one day per week or Wednesday and Thursday if it is for two days in a week (see paras 3.1.2(c) and 3.7.3) according to the PWI's or the AEN's Inspection Notes and not left to be done haphazardly by the Mate at his own discretion. On the basis of the inspection note the PWIs must issue clear instructions to the Mate in the gang diary regarding the picking up of slacks to be done on any particular day. The picking up of slacks will then be done by the Gangs according to these instructions from one end of their beat. In case there are any bad spots which have become dangerous the gangs may attend to that spot first only as a special case.

3.7.5 Alongwith picking up of slacks, removal of alignment and gauge kinks must also be done from one end of the gang beat to the other according to specified programme laid down by the P.W.I. in the gang diary. The gang mate should not be allowed to attend to such work haphazardly at his own discretion.

4. MONSOON ATTENTION:

- 4.1 The track will be maintained mainly by picking up of slacks.
- 4.2 Monsoon precautions as per standing instructions should be carried out. Chapter X, XI, XIV & XVII alongwith N.E. Railway's subsidiary instructions thereto should be carefully followed.
- 4.3 Frequent road tests should be made to locate the bed spots requiring attention. Information of bed spots with instructions to attend to them must be issued to the gang promptly.
- 4.4 In case of unusually heavy rains, all the gangmen should be deputed for intensive petrolling, both in day and night.

5. CREEP ADJUSTMENT:

- 5.1 The adjustment of creep and its prevention should be done accordance with CE's Circular No. 44 of 1965 (Revised 1965).

6. CURVE REALIGNMENT:

- 6.1 Realignment of curves should be done in accordance with CE's Circular No. 47 of 1965 (under issue).

7. DEEP SCREENING:

- 7.1 Ballast under a sleeper which has been in track for a number of years, consolidates into a hard mass and loses its elasticity. To restore the elasticity of the track it will, therefore, be necessary to thoroughly screen the ballast under the sleepers. The period after which such screening becomes necessary will depend on local conditions but generally it should not be necessary to screen completely more than once in twelve years.

7.2 As the bed under the sleepers gets disturbed during deep screening, such screening should normally be done only along with relaying, resleepering, respacing of sleepers or re-railing with new rails. At other times the screening of the consolidated bed should only be done after obtaining prior approval of the Deputy Chief Engineer.

7.3 When doing deep screening the sleeper beds should be broken up and thorough screening done in accordance with the instruction already prescribed for screening in connection with relaying of track, pages 1 to 4 of CE's Way Circular No. 35 of 1963.

7.4 A speed restriction is invariably necessary when screening to full section is being done. If deep screening is done without complete dismantling of the track then two contiguous sleepers spaces should never be worked at the same time. In such cases the best safety precaution is to have cut sleeper blocks put in under the rails in between the sleepers as additional supports.

7.5 When screening the lines in the yards particular attention should be paid to the drainage. Such drainage should be provided as laid down in para 3.5.3.

7.6 Screening of ballast in hot weather from April to June should be avoided and adequate precautions taken to ensure that no buckling of track occurs during screening operation. For this purpose, expansion gaps in the track should be examined and in case of creep the rails should be pulled back before work of screening is undertaken.

7.7 Since deep screening will be done only after an interval of 12 years, opportunity should be taken to check the existing grades and regrade the track as required. For this purpose, existing longitudinal levels should be taken in respect of rail top, bottom of ballast and cess. Plans should then be prepared showing the existing and proposed levels, and amount of deep screening etc. involved. Detailed instructions in letter No. W/275/O/W-7 dated.....

The P.Way Track Diagram Book and the depth of Ballast Diagram should be corrected, if necessary to show the new ballast cushion provided as a result of deep screening.

PART - II.

MAINTENANCE OF WELDED TRACK.

8. MAINTENANCE OF SHORT WELDED PANELS:

8.1 On this Railway there are certain sections where 3 or 5 rails of 13mm(42 ft.) or 12m(30 ft.) have been welded to form welded panel of 65 metres (210 ft.1/60 metres(195 ft.) or 39 metres (126 ft.)/36 metres (117 ft.), respectively. These welded panels will be termed as short welded panels" (SWP).

8.2 The Track Standards and Maintenance instructions as laid down in paras 2 and 3 of the "Instructions for Maintenance of Track laid with Welded Rail Panels" issued by the R.D.S.O. under their letter No.ET/JW dated 20/22.6.61 and circulated under CE's No.W/308/41/3/W-7 dated 29.12.1964 (also circulated earlier under No.W/308/41/3/6769 dated 31.10.61) and given in Annexure VI should be strictly followed. In addition to these the following subsidiary instructions should also be adhered to.

8.3 Provision of rail anchors or ACB plates shall be made in accordance with page 4 of CE's circular No.44 of 1965.

8.4 The track shall have clean ballast and have a minimum cushion of 8" or 10" and minimum shoulder width of 30 cm(12"). In case of track which is likely to be converted into long welded rails, a minimum shoulder width of 40 cm. (16") outside the ends of the sleeper should be provided by increasing the top width of the ballast section.

8.5.1 The short welded panels should normally be laid during the winter months near about the mean annual rail temperature which should be prescribed by the Distt. Engineers. At the time of laying, correct expansion gaps as prescribed in para 2.10 of the R.D.S.O.'s Instructions must be adhered to.

8.5.2 If for any valid reason welded rails are laid in track at a higher temperature on a particular day, the relaying on the next day should not be done until the rails laid on that day are de-stressed (as described in para 8.11 below) and joint gaps adjusted at the appropriate temperature by pulling in the rails. This procedure is obligatory on account of instructions contained in the Railway Board's letter No.62/W6/WRI/1 dated 30.2.1962.

8.6 Both rails of the welded panels should be fastened at the same time in order to avoid unequal thermal stresses in the two rails which may lead to buckling.

8.7 During the hot weather, from April to July, lifting, resleepering, or removal of fishplates and other operations involving removal of ballast should be restricted to the minimum and done only in the cooler part of the day as undue disturbance of track leads to reduction in its strength and may lead to vertical or lateral buckling. When overhauling, two contiguous space between sleepers should not be opened at the same time.

It is desirable that packing of the unwelded joints should be done by the Gang 2 days in a week and the entire gang length covered once in a fortnight.

8.8 All fastenings must be maintained to a first class standard in order to prevent the movement of the rail over the sleepers and to afford maximum lateral strength to the track. The assembly is most essential.

8.9 Good top surface and alignment are most essential as a bad top always means loose track which has little resistance to lateral or vertical track movement. Good alignment specially on curves is equally important as kinks may lead to buckling. On curves where the alignment is difficult to assess visually, curve movement on reference pillars should be fixed, 62 ft. apart, accurately to gauge distance from the outer edge of the inner rail of the curve for checking the alignment. The accuracy of these reference pillars should be frequently checked as they are liable to shift out of position.

8.10 The percentage of unserviceable sleepers should not exceed 10% in short welded panels. Also two consecutive sleepers or the joint or the shoulder sleepers should not be unserviceable.

8.11 DESTRESSING:

On this Railway the short welded panels have been laid so far at rail temperatures considerably different from the mean annual rail temperature. It is, therefore, necessary that destressing should be done one annually before the hot summer months at a rail temperature, within 5°C of the mean annual rail temperature. Destressing will also be necessary if any tendency for track to Kink or buckle is noticed. The destressing operations should be carried out under a traffic block as follows:-

8.11.1 All fishplates, fishbolts and nuts, dog-spikes and steel keys should be loosened to enable the rails to move freely. Rail anchors should be removed just before the block, by driving carefully with light hammer so as to be clear of the sleepers. An engine should then be run at a slow speed up and down four times at near about mean annual rail temperature. As some times it may be difficult to obtain an engine, alternatively, the destressing may be done by loosening all rail fastenings fishplates, lifting rails.

by crow bars and striking them by heavy mallets to allow them to move (Rollers are no longer found necessary by some foreign Railways).

8.11.2 Fish plates and fish bolts of the unwelded joints should be lubricated as per CE's circular No.45 of 1965. (Revised 1965), keeping in view para 8.13 below.

8.11.3 Expansion liners corresponding to the correct gap to be provided at the prevalent rail temperature, as given in para 2.10 of the RDSO's instructions, should be used.

8.11.4 The fittings, viz. fish plates, fish bolts and nuts, dog spikes and keys should be redriven tight commencing from the middle portion of the length taken up for destressing. Rail anchors should also be simultaneously redriven into position and the expansion liners should be removed. Two keying parties should be employed, one for each welded rail, in sufficient strength to complete the work, on both rails simultaneously, in as short a time as possible (see para 8.6).

8.11.5 The length of track taken up for destressing should be such as can be conveniently tackled in one traffic block. About (800 metres) $\frac{1}{2}$ mile length in each block is a reasonable length of track. If necessary, additional rail anchors should be provided in the adjoining lengths where destressing is not taken up at the same time to prevent any serious longitudinal movement of the portions concerned.

8.12 The welding of rail joints on girder bridges should not be done where sleepers have been secured to the girders, except for spans 100 ft. and above in which case the welding of joints can be permitted subject to special expansion joints being provided on the abutments and the piers. (Refer Rly. Board's letter No. 65/W6/WRL/3 dated 19.5.1965 circulated to DENs under CE's letter No. W/308/41/3/W-7 dated 27.5.1965). For detailed instructions in respect of spans 100 ft. and above, every case must be referred to the Chief Engineer for orders. For spans below 100 ft., the joints should be left unwelded with fishplates and no. A.C.B. plates or anchors provided. One rail length on either side should also be left unwelded and the track on bridge approaches should be heavily anchored to prevent any creep.

8.1.3 The lubrication of rail joints should be done only under personal supervision of an APWI or Section Mate in case of short welded panels. The lubrication through the keymen should not be attempted on short welded panels.

8.14 The short welded panels must not butt against crossing or stock rails at points and there should be one or two normal length rails in between which should be effectively anchored throughout their length, against movement in either direction.

9. GENERAL INSTRUCTIONS FOR THE INSTALLATION AND MAINTENANCE OF LONG WELDED RAILS.

9.1 DEFINITIONS:

9.1.1 LONG WELDED RAIL:

The name "Long Welded Rails" is given to rails, the central part of which never undergoes any movement due to temperature alternations. The minimum length fulfilling this condition depends on conditions of climate, ballast and method of fixing the rails. The 300 metres ($\frac{1}{2}$ mile) long welded panels proposed to be laid on this railway will be designated by the name of "Long Welded Rails" (L.W.R.).

9.1.2 RAIL TEMPERATURE:

Is the temperature of the rail as recorded by a rail thermometer at site.

9.1.2.1 A simple type of rail thermometer may be constructed by arranging the mercury 'bulb' of any ordinary thermometer in a cavity drilled inside the head of a rail piece, the cavity being filled with mercury.

9.1.3 MEAN ANNUAL RAIL TEMPERATURE:

Is the average of the maximum annual and the minimum annual rail temperature.

9.1.3.1 From the records available, it is anticipated that the maximum annual rail temperature will be 66°C and minimum annual rail temperature, 0°C . The mean annual rail temperature will, therefore, be 33°C .

9.1.4 THE NEUTRAL TEMPERATURE:

Is the rail temperature at which the rails are in a neutral 'or' stress-free condition.

9.1.4.1 In order to increase the safety against buckling of track, the neutral temperature value may be fixed 5°C , higher than the mean annual rail temperature. (This will, of course, mean putting up with higher tensile stresses during the winter.)

9.1.4.2 With the value of mean annual rail temperature of 33°C , as given in para 9.1.3.1 above, the neutral temperature will work out to 38°C .

9.1.5 THE INSTALLATION TEMPERATURE: is the mean rail temperature during the period of fastening down of rails.

9.1.5.1 Allowing for a working limit of $+3^{\circ}\text{C}$ the installation temperature may be fixed is $38^{\circ}\text{C}+30\text{C}$ or 35°C to 41°C .

9.1.6 THE WORKING TEMPERATURE LIMIT: is the maximum rail temperature beyond which it is forbidden to perform any operations involving removal of shoulder ballast or ballast in between sleepers and involving disturbance to sleepers.

9.1.6.1 For the present track standards, the working temperature limit of 10°C above mean annual rail temperature, i.e., 43°C , may be adopted.

9.1.6.2 For performing operations mentioned in para 9.4.11, in case of emergency, a suitable speed restriction must be imposed and precautions taken to check longitudinal and lateral movements. In any case the working temperature limit must not exceed 15°C above the mean annual rail temperature i.e., 48°C .

9.1.7 SWITCH EXPANSION JOINT: is a device installed at the end of a L.W.R. to allow for any longitudinal movement which may take place due to temperature variations over the 'breathing' ends of the L.W.R.

9.1.7.1 Switch expansion joints to R.D.S.O's Drg. Nos. C.S.O/C-2064(M) for 75R and C.S.O./C-2074(M) for 60R section must be installed at the ends of the 800 metres ($\frac{1}{2}$ mile) long L.W.R. by means of 'machined joints' as indicated on the drawings.

9.1.7.2 Switch expansion joints must also be provided at places where the direction of curve changes from left hand to right hand.

9.1.7.3 Switch expansion joints must also be used on either side of insulated block joints. In such cases one normal length (42' / 39' or 13m / 12m) rail must be laid between an insulated joint and the expansion joint and in this normal length rail all sleepers must be 'box' anchored or provided with two-key type A.C.B. plates.

9.1.7.4 Switch expansion joints should not be located on the transistions of the curves.

9.1.7.5 Switch expansion joints must be so located that there shall be no change of gradient within 10 metres of the centre of the expansion joint nor a change of gradient exceeding 0.25% within 50 metres of the centre of the expansion joints.

9.1.8 DESTRESSING: Destressing a L.W.R. is the adjustment of the rails to a regularised stress-free condition related to the neutral temperature (38°C).

9.1.8.1 Destressing must be done with the rail temperature within 3°C of the neutral temperature, 1.1, within the temperature range of 35°C to 41°C .

9.2 TRACK STANDARDS NECESSARY FOR L.W.R.

9.2.1 MAXIMUM CURVATURE:

For M.G., the maximum curvature on mental sleepers shall be 5° (350 metres radius) and on hard wood sleepers, 3° (580 metres radius)

9.2.2 STEEPEST GRADIENT: The L.W.R. shall not be laid on grades steeper than 1 in 200.

9.2.3 VERTICAL CURVES:

9.2.3.1 For correct longitudinal level and gradient changes, vertical curves of adequate radius should be established by level and provided during relaying and track well consolidated before laying the L.W.R.

9.2.3.2 In this connection attention is drawn to para 819 of the I.R.W.W. Manual which lays down that rate of change of grade in successive chords on a vertical curve should not be greater than 0.10% on summits and 0.05% in sags.

9.2.4 BALLAST:

9.2.4.1 Only broken ballast possessing sharp edges and made from stone of good strength, durability and density shall be used, both for packing and boxing.

9.2.4.2 The ballast shall be sufficient and clean to provide a minimum shoulder width of 40 cms (16") and a depth below the bottom of sleepers of 25 cms (10"). Ballast section shall conform to the standard ballast section except for the shoulders.

9.2.4.3 On relatively sharper curves, extra lateral strength on the outside may have to be built up by increasing the extra width of shoulder ballast, by heaping up ballast on the top line of the boxing outside the outer sleeper ends or by even attaching 'locking caps' (see sketch in Annexure VII) penetrating 10cms. deep into the ballast bed.

9.2.5 FORMATION:

2.5.1. The formation shall be well consolidated and efficiently drained.

2.5.2 Unstable formation or situations where the rails are likely to rust or wear rapidly, or, where track has to be opened frequently should be avoided.

9.2.5.3 CESS: An adequate cess must be provided for L.W.R. The cess should not be too low, as measured from the top of the ballast section, nor should it be too narrow to check, effectively, tendency of ballast to slip under vibrating action of high speed trains.

9.2.6 DRAINAGE: The track drainage must be adequate and in proper working order, including cross fall to the formation.

9.2.7 ALIGNMENT AND LEVEL:

9.2.7.1 Good top surface and alignment are most vital. A bad top always means loose track with little resistance to lateral or vertical track movement. Good alignment especially on curves is equally important as kinks may lead to buckling.

9.2.7.2 On curves, where the alignment is difficult to assess visually, unshakable curve monuments or reference pillers should be fixed, 62 ft. apart, accurately to Gauge distance from the outer edge of the inner rail of the curve for checking the alignment. (Recovery posts fixed in connection with curve realignment can be used for this purpose). The accuracy of these reference pillers should be checked frequently as these are liable to shift out of position.

9.2.7.2 Similar reference pillers shall also be erected along the straight, about 150 metres apart, for correct maintenance of level and alignment and also for keeping a check on the creep of rails.

9.2.7.4 Proper alignment of rails before welding to convert these into L.W.R. is essential. As panels made from old rails cannot, generally, satisfy this condition, only new rails should be used for making L.W.R.

9.2.8 SLEEPERS:

9.2.8.1 The minimum sleeper standard shall be 1500 per Kilometre (N+6).

9.2.8.2 Soft wood sleepers should not be used under L.W.R.

9.2.8.3 In case hard wood sleepers are used, two key type A.C.B. plates shall be provided on all sleepers.

9.2.3.4 In addition, on the first hundred sleepers (wooden or metal), on either side of the expansion joint, four rail anchors per sleeper-two on either side-should be provided to arrest movement of rails to the maximum extent.

9.3 METHOD OF LAYING LONG WEIDED RAILS:

9.3.1 DETERMINATION OF LENGTH OF L.W.Rs.

The lengths of L.W.Rs must be decided in advance depending upon the locations of stations, bridges, change of gradients, curves etc. In any case, for the present, the lengths must be restricted to 300 metres ($\frac{1}{2}$ mile) and should be multiples of the length of the existing S.W.Ps of 65 metres/60 metres (210'/195' in case of 5 rail panels or 39 metres/36 metres (126'/117') in case of 3 rail panels.

9.3.2 RENEWAL OF RAILS AND SLEEPERS:

9.3.2.1 The sleeper renewal along with deep screening of ballast for providing a clean ballast cushion of 25 cms. (10") must be taken up first in advance and the ballast allowed to consolidate thoroughly for a period of atleast one month, before rail renewal is taken up.

9.3.2.2 In cases where the new sleepers can not be provided with the old rails (e.g. renewal of existing 60R rails with new 75R rails with provision of new hard wood sleepers with A.C.B. plates for 75R or new 75R CST-9 sleepers), the new rails must first be laid as S.W.P. of 65 metres (210 ft.) or 60 metres (195 ft.).

9.3.2.3 The above procedure will allow sufficient time for the new sleepers to take a firm bed; rail top and levels can be brought upto the required high standard for the L.W-R. Incidentally, sleeper renewal in advance will also save considerable time as it can be done at any time, regardless of the temperature,

whereas laying of L.W.R. must be done nearabout mean annual rail temperature, which restricts the work to a certain period of the year only.

9.3.3 LAYING OF THE SWITCH EXPENSION JOINTS:

9.3.3.1 The switch expansion joints should be laid in at the proposed ends of the L.W.R. lengths, and elsewhere as required, with the machined joint panel at either end, at neutral temperature with the tongue and the stock rail in the mean position. A rail length with fish plates (preferably jogged or clamping fish plates) must be left on one side of the switch expansion assembly, between the machined joint panel and the adjacent S.W.P.

9.3.3.2 Special unshakable movements or 'Harkers' should be provided opposite the switch expansion joint for watching the movement of rail ends, caused by daily and seasonal changes of temperatures.

9.3.4 THERMIT WELDING 'IN-SITU' FOR CONVERSION INTO L.W.Rs.

9.3.4.1 After the track has well consolidated, over a suitable period, the L.W.R. may be installed by either replacement of the normal length rails by 130 metres (420 ft.) long panels (formed by thermit welding on the cess of 65 metres (210 ft.) flashbutt welded or thermit welded panels) to be further thermit welded, in track to form the L.W.R., or by thermit welding, in track, of the normal length rails to form the L.W.R.

9.3.4.2 The renewal of old rails by 65 metres (210 ft.) or 130 metres (420 ft.) S.W.Ps must be done in such a manner as to leave a gap of 10 to 12 mm between panels, at mean annual rail temperature. If the temperature is more, the gap should be proportionately reduced.

9.3.4.3 The S.W.Ps. of 65 metres (210 ft.) or 130 metres (420 ft.) should now be welded, at a temperature

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close to the mean annual rail temperature, taking care that at the time of welding a gap of 10 to 12mm is available; otherwise the thermit weld will be weak.

9.3.4.4 Sufficient welding parties must be available at site to ensure that the full length of each L.W.R. between two switch expansion joints, is thermit welded on the same day. All joints of each L.W.R. must thus be welded except those of the fishplated rail on one side of switch joint assembly, mentioned in para 3.3.1 above.

9.3.4.5 For thermit welding in-situ the following precautions must be taken-

9.3.4.5.1 Two opposite joints should not be welded at the same time as alignment and levels of the joint get disturbed, while aligning and levels of the joint get disturbed, while aligning and levelling the opposite one.

9.3.4.5.2 It is of advantage to weld when the temperature is rising i.e., early morning. At falling rail temperatures, causing tensions at the rail ends, the finished thermit weld is likely to get fractured.

9.3.4.5.3 The gaps for welding must be maintained at 10 to 12mm, if necessary, by pulling the rail panels (when possible) or by cutting the rail ends by 1/8" or 1/4" as required. The cutting of rail ends may be done by hack-saw or by petrol-driven rail-cutting machine.

9.3.4.5.4 Care must be taken to see that welding must not be undertaken when the rail temperature is rising very suddenly as this may result in the gap for welding being reduced beyond the tolerable limit, within the period of welding.

9.3.4.5.5 Rail ends must be properly aligned and levelled before welding. Any badly kinked rails or misaligned welds must be cut out and re-welded.

9.3.4.6 WELDING OF RAIL JOINTS ON GIRDERS:

BRIDGES: should be done as per para 8.12 of the maintenance of Short Welded Panels.

9.3.5 DESTRESSING:

9.3.5.1 The L.W.R.sq installed must be 'destressed' at the earliest opportunity, when the temperature is near about the 'neutral' temperature, i.e., between 35°C and 41°C. It is desirable to carry out the work of destressing in the morning. At this time, the temperature will be minimum and the L.W.R. the shortest whereas in the evening the temperature being high and falling, opening out may release stresses, locked up as a result of the restraint of the fittings on the heated rail.

9.3.5.2 The destressing of the L.W.Rs must be done in as indicated in para 8.11 in connection with 'Maintenance of S.W.P.' (Any one of the two methods mentioned in para 8.11.1 may be followed depending on local circumstances).

9.3.5.3 At the time of destressing the fishplated rail length adjoining the switch expansion joint assembly (mentioned in para 3.3.1) should be removed the switch expansion joint brought back to its 'mean' position and the length of fishplated rail length adjusted (by cutting) in necessary or by providing a longer rail piece. 'Closure' welds should then be completed, at 'neutral' temperature, ensuring gaps of 10mm to 12mm at both ends of the 'rail length' mentioned above.

9.3.5.4 Immediately after destressing, at the neutral temperature, the position of the toe of the switches must be marked on the 'Markers' and stock rail by chisel marks. These marks will now indicate the zero position of the switches.

9.3.6 After laying the track with L.W.R. and adjusting the fastenings and expansion joints, near-about the neutral temperature, special care must be taken to put the track in correct alignment and level, with good uniform packing under all sleepers. This work must, however, be undertaken only if the rail temperature is below the 'working temperature limit' or 43°C .

9.4 MAINTENANCE OF L.W.R. (Long Welded Rails)

9.4.1 As sufficient experience is not available regarding the maintenance of L.W.R. for the present paras 4 and 5 of the instructions issued by the R.D.S.O. (reproduced as Annexure VI) should be followed along with the following subsidiary instructions or minor modifications.

9.4.2 In general the maintenance of L.W.R. must be based on the fact that the less the work is done on them the more stable these are and it must not be forgotten that lifting them up unduly at any point can lead to appreciable deformations. The fastenings must be maintained very tight and there must be plenty of ballast specially at the end of the sleepers.

9.4.3 Annual systematic operations like overhauling and through packing, as a routine, should not be carried out on the L.W.R. and only the defective spots should be attended to. This will avoid unnecessary disturbance to track laid with L.W.R. and maintain the stability of track at a high order.

9.4.4 Rail thermometers must be available with each gang maintaining the L.W.R. and these must always be read before any maintenance work is taken up on the L.W.R.

9.4.5 Special fishplates (joggled or clamp fishplates), useable over joints welded by thermit process, must be provided to gang mates concerned for emergent use in case of a broken rail or a welded joint developing a crack or failure..

9.4.6 The gang strength on the L.W.R. should for the present be normal but the gangmate should be of the rank of a section mate in grade 130-212(A.S.) and capable of reading the rail thermometer and recording the rail temperature as well expansion and contraction movements of rail ends at the expansion switches.

9.4.7 Every 20 Kms. (12 miles) stretch of the L.W.R. lengths should be in the charge of a senior A.P.W.I. who is well conversent with the maintenance procedures of the L.W.R. track.

9.4.8 The working hours of gangs maintaining L.W.R. during the hot summer months must be kept as 5.30 to 10.30 hours in the morning and 18.30 hours to 19.00 hours in the evening. Normal working hours may be maintained during the winter months. During the hot summer months when the rest of the gang takes the mid-day recess, one senior gangman must be deputed for every mile from 10.30 hours to 15.00 hours to patrol and keep a close watch on the condition of the track, tendency towards kinking etc. Any tendency at creep must be checked by providing additional anchors etc.

9.4.9 DESTRESSING:

9.4.9.1 Destressing of L.W.R. should be done annually in April in advance of hot summer months at a temperature nearabout the neutral temperature (see paras 1.8 and 3.5). Procedure similar to that indicated in para 8.11 for maintenance of S.W.P. should be followed.

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9.4.9.2 Destressing must also be carried out if marked difference is noticed between the maximum annual expansion and maximum annual contraction from the mean position at the expansion switches.

9.4.9.3 Destressing must also be carried out if any tendency at kinking or towards buckling of track is noticed.

9.4.10 BALLAST:

9.4.10.1 The track must be kept full boxed all the time, as far as possible, and all operations involving temporary removal of shoulder ballast or ballast in between sleepers must be performed in as short an interval as practicable, and within the working temperature limit.

9.4.10.2 The ballast in between the sleepers and at the sleeper ends must be thoroughly tamped by remmers as this will considerably increase the lateral resistance of the track.

9.4.10.3 A tendency for sleepers, within the 'breathing' lengths at the ends of L.W.R., to move towards the expansion switches may be noticed and should be attended to by redressing and consolidation of ballast between the sleepers. A surplus of ballast must be provided at these locations to allow for this.

9.4.10.4 No weakening of the ballast shoulder by digging out trenches etc. by any department or outside party, is to be allowed without the authority of the Distt. Engineer.

9.4.11 All operations involving temporary removal of ballast in sleeper cribs or at sleeper ends must be restricted to a length of 30 metres and must be performed while the temperature is fairly close to the mean annual rail temperature and must, in any case, not be performed if temperature exceeds 10°C above the mean annual rail ...

temperature, i.e., the working temperature limit of 43°C should be observed. In emergency such operations may be performed at temperatures upto 15°C above the mean annual rail temperature i.e., upto a rail temperature of 48°C provided a suitable speed restriction is observed and not more than 10 consecutive sleeper spacings are opened, at a time. Two contiguous spaces between sleepers should not be opened at the same time.

9.4.12 OPERATIONS INVOLVING LIFTING OF TRACK:

4.12.1 Operations involving lifting of track from the ballast bed should be performed in winter months and, in any case, not when the rail temperature is more than 8°C above the mean annual rail temperature, i.e., at a temperature not exceeding 41°C .

9.4.12.2 Before any excessive lifting is attempted, enough ballast must be collected at site to make up the full ballast section prescribed for L.W.R.

9.4.12.3 For the purpose of lifting, not more than 30 metres of track should be opened and lifts of not more than $1/4"$ to $1/2"$ attempted at a time, ensuring that at any time not more than 10 consecutive sleepers should be without full ballast support underneath.

9.4.13 SLEWING OF TRACK:

9.4.13.1 The opening out of track for the purpose of slewing must be restricted to a length of 30 metres and should not be carried out if the temperature exceeds 10°C above the mean annual rail temperature, i.e., at a temperature less than 43°C .

9.4.13.2 The extent of slewing must not exceed $1/4"$ to $1/2"$ and must be restricted to the removal of kinks only. Heavy slewing disturbs the lateral resistance of the track.

9.4.14 THROUGH PACKING:

9.4.14.1 Through packing of L.W.R. as a routine annual operation, should not be carried out and only the defective spots should be attended to an through packed.

9.4.14.2 While through packing defective spots, instructions laid down in para 4.11 above as well as para 5.5 of the R.D.S.'s instructions must be followed which lay down that the maximum length to be opened out a time must be restricted to 30 metres, ensuring that there are 10 fully ballasted sleeper interspaces between the two opened out lengths of 10 sleepers interspaces. This operation must be performed within the working temperature limit of 43° C

9.4.15 MAINTENANCE OF SWITCH EXPANSION JOINTS:

9.4.15.1 PACKING: Particulars attention must be paid to the packing of the switch expansion joints. These must always be kept well packed.

9.4.15.2 All sliding contact surfaces must be oiled or greased atleast once a week.

9.4.15.3 The expansion switch must be brought back to its 'mean' position alongwith the destressing of the L.W.R.

9.4.16 ACTION IN CASE OF BUCKLING:

Notwithstanding all precautions, there are chances that a kink or buckle in track may develop during the hot weather. In such circumstances, the first consideration must be for the protection of traffic. As a temporary expedient for passing trains, the track portion in question may be slewed into a smooth curve of as big a radius as possible and the trains passed at a restricted speed.

9.4.17 ACTION IN CASE OF RAIL FRACTURE:

9.4.17.1 More rail failures are anticipated from L.W.R. than from ordinary fishplated track or S.W.P. When the failure is at about the neutral temperature, the fastenings should be loosened for 50 metres on either side of the fracture and retightened after releasing the strain. Taking care that no cut is made nearer than 2 metres to the nearest weld, cut the rail about 2 metres on either side of the fracture and replace the part cut by a 4 metres long section of the same profile, with approximately the same degree of wear. This piece should be thermit-welded in position, ensuring gaps of 10-12 mm. at the joints just before welding.

9.4.17.2 If the fracture occurs at a temperature for different from the laying temperature a short piece of rail, about 4 metres long, should be fishplated by using joggled fishplates with gaps at each end as for ordinary fishplated track. When the temperature comes back to the range of laying, the fishplated sections should be taken out and the procedure outlined in para 9.4.17.2 followed.

9.5 RECORDING OF DATA FOR L.W.R.

9.5.1 In order to gain more experience in maintenance of L.W.R. it is necessary that sufficient data be recorded regarding behaviour and maintenance of L.W.R.

9.5.2 RAIL TEMPERATURE: Recording of rail temperature of site must be made, personally by the A.P.W.I. in charge, four times daily, at 6.00 hrs., 12.00 hrs., 14.00 hrs. and 18.00 hours.

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9.5.3 Movement of the toe of the switch and the stock rail with respect to the zero position on the 'markers' must be recorded daily by stretching a string along the chisel marks on the two markers and measuring from it the position of the toe of the switch and the chisel mark on the stock rail, at 6.00 hours, 12.00 hours, 14.00 hours and 18.00 hours. The position towards Gorakhpur and is to be shown as (+) and away from Gorakhpur as (-).

9.5.4 The details of track inspection done must be recorded separately by the APWI/PWI in a manuscript register indicating the nature of defects noticed, number of sleepers affected, percentage of loosely packed sleepers, percentage of loose and missing fastenings, the extent of kinks notice, say chord 6 metres long.

9.5.5 The extent of work done by the gang must also be faithfully recorded in the gang diary. Besides indicating the location and the nature of work done the number of gangmen actually employed for the operation and quantum of work done per gangmen must also be mentioned. As far as possible, the work must be carried out only under the specific orders of the APWI In-charge of L.W.R. section.

10. GENERAL:

10.1 CHECK OF GANG WORKS:

The work of each gang should frequently be checked during P.Way Inspection as laid down in circular No.39 of 1964. Road test as laid in circular no.40 of 1964 must be carried out to examine the actual condition of track and appropriate action taken.

10.2 RESPONSIBILITY OF THE PWI AND AEN:

It must be clearly understood that the Permanent Way Inspector is primarily responsible, and the Assistant Engineer is generally responsible, for the maintenance and safety of track and therefore, if any spot of track requires immediate attention, they should attend to the defects in track irrespective of the broad programmes laid down in this circular and they have full freedom in this respect.

(ANNEXURE I)

ANNUAL PROGRAMME FOR REGULAR TRACK MAINTENANCE:

Season	Period		Days per week	W O R K
	From	To		
Post- Mon- soon.	15th Oct.	15th Feb.	5	Overhauling, as per para 3.1 as a first turnover of through packing with screening for the entire gang length, starting from the end of the gang length opposite to the commencing end of last year.
			1	Picking up of slacks, as per para 3.7, attention to bridge approaches, level xings, charts etc., according to programme laid down by the P.W.I.
	16th Feb	15th March	4	Lubrication of rail joints/ Attention to points & xings. as per paras 3.2 & 3.3 respectively.
			2	Picking up of slacks, as per para 3.7, attention to bridge approaches, level xings, inspection notes, hallade charts etc., according to a programme laid down by the P.W.I.
	16th March	15th April	5	Systematic through packing as per para 62 of I.R.W.W. Manual-second turnover for the entire gang length.

Season	Period		Days per week	W O R K
	From	To		
Pre- Mon- soon	16th April	15th June	4	Systematic through packing as per para 622 of the IRWW Manual second turn-over continued.
			1	Picking up of slacks, as per para 3.7 attention to bridge approaches, level crossings, inspection notes, ballade charts etc., according to a programme laid down by the P.W.I.
			1	Clearing of side and catch-water drains, earth work repairs to cess and attention to yard drainage as per CE's plan Nos. CE/P/110/64 dt. 26.11.64 and CE/P/111/64 dated 30.11.64.
Mon- soon	16th June	15th Oct		Attention to track as required. This will primarily include picking up of slacks and attention to side drains, catch water drains and water ways. During abnormally heavy rail patrolling of the line by gangs be carried out in addition to regular monsoon patrolling by day & by night. NOTE: Creep adjustment, deep screening, curve realignment, large scale casual renewal earth work repairs should be carried out as necessary by employing extra labour.

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGNS & STANDARDS ORGANISATION
ELLERSLIE SIMLA - 2

No. ET/JW

Dated: 20th June 1961
22nd

The General Manager,

- (1) Central Railway, V.T., Bombay.
- (2) Eastern Railway, Calcutta.
- (3) Northern Railway, Baroda House, New Delhi.
- (4) North Eastern Railway, Gorakhpur.
- (5) North Eastern Frontier Railway, Pandu.
- (6) Southern Railway, Madras.
- (7) South Eastern Railway, Garden Reach Calcutta.
- (8) Western Railway, Churchgate, Bombay.

Sub:- INSTRUCTIONS FOR MAINTENANCE OF
TRACK LAID WITH WELDED RAIL PANELS

In the resolution passed in the Chief Engineers and Engineers - in-Chief Conference, held in Simla from 17th to 21st June, 1960 on subject No. 20 (welding of rail joints), it was desired that "the reporter may draw up detailed instructions for maintenance of welded track, in consultation with all the Railways, and submit the same for the next conference". Railway Board's orders on this resolution were circulated under their letter No. 59/W1/ETCE/3 dated 24.2.61. The same are reproduced below for ready reference:-

"Noted. Railways should expedite the trials with half mile long welded rails so that a decision in regard to their adoption on a large scale can be taken.

Detailed instructions for laying and maintenance of welded track should be finalised by R.D.S.O. and circulated to the Railways and later incorporated in the Way and Works Manual. "

2. The draft "Instructions for maintenance of track laid with welded rail panel," prepared by R.D.S.O. were discussed in the 18th meeting of the Engineering Section of the Indian Railway Conference Association held in Delhi from 1st to 3rd May, 1961. The Engineering Section resolved that the instructions

pertaining to the maintenance of short welded panels could issue for adoption on Indian Railways, after incorporation therein the modification proposed by it. In respect of maintenance of long welded rails, however, the Engineering Section felt that adoption of uniform rules should pend till more information was available from the results of the trials now under-way or planned.

3. The enclosed "Instructions for maintenance of track laid with welded rail panels" incorporate the modification proposed by the Engineering Section in respect of short welded panels, and this part of the "Instructions" is desired to be adopted, henceforward, on all the Indian Railways. The suggestion of the Engineering Section in respect of instructions pertaining to long welded rails has been incorporated in paragraph 1.7 of these "Instructions", which mentions that Sections 4 & 5 are meant as guidance for Railways carrying out trials with long welded rails.
4. Attention is invited to Railway Board's orders, quoted above, that "Railways should expedite the trials with half-mile long welded rails, so that a decision in regard to their adoption on a large scale can be taken". Railways, which have not yet started these trials may kindly take urgent action in this matter, under advice to this office and Railway Board. Six-monthly reports on trials, already underway and those now to be undertaken, may also kindly be sent, by all Railways in the first week of April and October, bringing out all the aspects of the trials, including any savings in the cost of maintenance.
5. Instructions for laying long welded rails can be finalised only after more Railways have started trials with half-mile long rail panels in track and have reported on their experience with laying these long welded rails and their maintenance aspects, in the period immediately following the laying.
6. The receipts of this letter may kindly be acknowledged.

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8 copies of the
instruction

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for DIRECTOR GENERAL

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Instructions.

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for DIRECTOR GENERAL

No.W/308/41/3/6769

Dt. 31.10.1961

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SPJ, KIR(W) at MNE/ All AENS & PWIs for informa-
tion and guidance.

Copy to Dy.Chief Engineer(W) & (EAST) and DEN/
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TRACK SUPPLY OFFICER.

No. W/308/41/3/W-7

Dated. 29/12/1964

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30 copies to Each DEN*
15 copies to TEN.-----

for CHIEF ENGINEER