

SPECIAL CONDITIONS OF CONTRACT OF RECONDITIONING OF POINTS AND CROSSINGS AND SEJ

1. The Welder who performs the job of reconditioning should have certificate from firm approved by RDSO for supplying H3C and H3A class electrode and tenderer will also produce the certificate with tender document. In clearance of this certificate the tender document will be treated incomplete and likely to be summarily rejected.
2. Contractor should have the certificate from the firm authorized by RDSO for H3C and H3A class electrode for the execution of the above job.
3. Contractor should have the certificate for firm authorized by RDSO/LKO for the procurement of the genuine materials.
- 3.1. Only skilled of highly skilled welder who has been trained and certified by RDSO for welding/recondition work holding a valid competency certificate shall be used for reconditioning work. A copy of valid competency certificate with identity card should be submitted along with tender document. In clearance of this certificate the tender document will be treated incomplete and likely to be summarily rejected.
4. **Work Specification.**
 - 4.1.1 These Special tender conditions, Instructions to tenderer and the General Conditions of Contract (GCC – 2022) as amended from time to time and up – to - date shall govern the work done under this contract. Where there is any conflict between these, the special conditions will prevail.
 - 4.1.2. The work shall conform to manual metal are welding electrodes brand under H3C and H3A class as per IRS specifications and approved by RDSO/LKO.
 - 4.2 **Scope of Work :**
 - 4.2.1 The work will be carried out by Contractor as per provisions of the contract under the supervision of P.Way Official of the Railway by deploying the entire welding team skilled/unskilled labour etc.
 - 4.2.2 The work of reconditioning of Crossing / Tongue rails shall be done in situ / under traffic or on Cess as per requirement. In case of work being done under traffic, though all effort will be made for arranging of suitable speed restrictions / traffic block, however, the contractor shall have no claim on the Railway non availability of traffic block / caution order.
 - 4.2.3 The entire welding as required for carrying out the reconditioning work along with filing/ grinding shall be engaged by the Contractor at its own cost. No Tools & Plants or Electricity etc. will be supplied by the Railway. All the Tools & Plants, materials and machinery will be carried to and from site by the Contractor at his own cost.
 - 4.2.4 The contractor shall be responsible for proper filing / grinding of reconditioning work and final finished surface shall be within specified tolerance to the full satisfaction of the site Incharge.
 - 4.2.5 Reconditioning of crossing where ever wear is more than 6mm at nose will only be carried out along with that of Wing rails. Crossing wise register will be opened by SSE (P.Way)/Incharge and wear measurements should be recorded for each crossing separately before actual work of reconditioning is taken in hand. This should be signed by both the SSE (P.Way) and Contractor and checked 100 % by Incharge before actual welding is taken in hand.
 - 4.2.6 While doing reconditioning, recommendations by RDSO should be followed and the work will be done during the day time only and when the weather is clear.
 - 4.3. - **Quality Control:**
 - 4.3.1. The welder who will perform the job of reconditioning should have the certificate from the firm approved by RDSO for H3C and H3A class electrode.
 - 4.3.2 The reconditioning crossing/switches should have guaranty of satisfactory performance for 6 months and for which 10 % of the cost of the work will be retained by the Railway for the guarantee period. In case of failure of any crossing/switches within 6 months from the date of

reconditioning or from the date of inserting into track, the reconditioned work will be done by the contractor at their own cost and nothing extra will be paid by the Railway for that.

- 4.3.3- In case of failure of any reconditioned crossing/switches, the Contractor has to re-do its reconditioning at his own cost within a period of Six months, which will be intimated by the Engineer in charge.
- 4.3.4- If the second reconditioning work is not done by the contractor within two months from the period as mentioned in para 4.3.3 above, deduction will be made from the Contractor dues, at the double of the rate of payment made to him for that particular reconditioned work as a penalty.

5.0 Miscellaneous :

- 5.1 A competent Railway Supervisor will be arranged by Railway to supervise this work. A log book for the daily work assignment and progress will be maintained by the Railway Supervisor. This log book should be separate from the site order book, meant for instructions to be given to the contractor by inspecting authorities.
- 5.2.1 The Contractor should employ a competent Supervisor whose technical knowledge has been checked for such work and certificate issued.
- 5.3.- Work should only be permitted in the presence of the Railway and Contractor's authorized Supervisor. SSE (P.Way)/Incharge will ensure that no work is under taken without the presence of the authorized Railway or Contractor Supervisor.
- 5.4.- The Contractor will be responsible for safety of track as well as its labour and tools & plants.
- 5.5.- The Contractor shall not start any work without the personnel presence of the authorised Railway supervisor / PWI at site. In case, contractor representative starts any work in absence of Railway supervisor / PWI, it shall be treated as unauthorized and illegal, tempering with the track and the contractor will be liable for action under the 'INDIAN RAILWAY ACT'.

Signature of Tenderer (s)

Date.

II. Specification for re-conditioning of worn out Points & Crossing, CMS Crossing and Switch expansion joint.

1.0 Selection of worn out Points & Crossings, For re-conditioning

1.1 Condition:

Points and crossing to be re-conditioned by welding should be in good condition and certified by the sectional Section Engineer Permanent Way for their suitability for reconditioning and should normally not exceeded specified limit of wear. Points and Crossings containing cracks on the worn out portion having depth more than 3mm (as determined by gauging) beyond the condemning size shall not be selected for further reconditioning. Ultrasonic testing should be carried out as per code of procedure to decide the serviceability. Points & Crossings having internal defects should not be reconditioned.

1.2 Wear limits

As far as maximum vertical wear limit on wing rails and nose of crossing is concerned, the existing provision of 10mm vide 237(3) (e) of IRPWM will continue. However, on Rajdhani/Shapahdi routes, as a good maintenance practice, crossings and the wing rails should be planned for reconditioning before reaching the following wear limits. Built up Crossings : 6mm CMS Crossings : 8mm

(Ref: Rly Bd's Lr.No. 91/Track-III/TM/28 Dt. 12-1-1994)

2. Various Resurfacing Techniques:

2.1 Single electrode technique

In this system of welding, only one type of electrode is used to make up for the entire worn-out portion of the crossing. The worn out points & crossings can be resurfaced by this method by gradually depositing number of layers as per requirements with 4mm dia electrode.

2.2 Depot resurfacing:

Points and crossings are usually brought from site to the welding depot and then they are resurfaced following the conventional manual arc or continuous wire welding process using transformer or rectifier. The reconditioned crossing is then ground, properly profiles and again transported back to the site for re-use in track.

2.3 In-situ resurfacing

To avoid undue transportation as well as loss of man-power and time, in situ resurfacing can be resorted to. In this technique, reconditioning of crossing can be done on track itself, after taking block or only on caution order following the conventional arc welding techniques. For such in site welding, portable DC welding generator is to be used, which can be carried easily to the welding site.

2.4 Current practice:

2.4.1 As per the extant instructions of the Railway Board single Electrode System and Continuous wire welding process will continue. No other process/system will be used without specific and prior approval of RDSO. The welding process may be undertaken either at depot or in situ as specified in the tender schedule.

2.4.2 Similarly, from the convenience point of view, it is preferable to resort to in situ resurfacing techniques, specially, for built-up crossing, since transportation of crossings from site to depot and back is avoided saving considerable time and effort. Moreover, it is also beneficial in case of turnouts where heel/toe joints of switches and crossings have been welded with lead/main line rails. In case of CMS crossings, the temperature is to be particularly controlled during the welding process either by keeping the crossing submerged in a water bath or by resorting to air quenching. Therefore, in situ reconditioning of CMS crossings will need additional precaution.

3.0 Welding Electrodes:

3.1 Approved brands of electrodes:

H1 and H2 class of electrodes has since been withdrawn for use in reconditioning of worn out points and crossings by welding. Only H3C series of electrodes duly approved by RDSO are to be used for this purpose. Electrodes manufactured by firms approved in current vendor list issued by RDSO only shall be used in the reconditioning work. The above list is subject to the revision every year by RDSO.

3.2 Class of electrodes used in respect of traffic density:

All electrodes now used for welding purposes fall under H3 series, though they have been further classified into H3, H3A & H3B classes.

Based upon their traffic carrying capacity as detailed below:

- (a) H3 Class to achieve minimum service life of 15GMT.
- (b) H3A Class to achieve minimum service lift of 25 GMT.
- (c) H3B Class to achieve minimum service life of 35 GMT.
- (d) H3C Class to achieve minimum service life of 50 GMT.
- (e) The class of electrode shall be as specified in the tender schedule.

4.0 Welder:

Only skilled of highly skilled welder who has been trained and certified by RDSO for welding/recondition work holding a valid competency certificate shall be used for reconditioning work. A copy of competency certificate with identity card should be lodged with SE/PW & ADEN in-charge of work before commencement of the work.

5.0 List of equipment required for reconditioning.

5.1 For Crossing & Switches fabricated from 72 UTS or 90UTS rails

Equipment required for (flux shielded) metal is listed below:

- (i) A portable welding generator DC set or AC set with 90 OCV or more
- (ii) Welding cables.
- (iii) Electrode holder
- (iv) Ground clamp
- (v) Welding electrodes
- (vi) Pre-heating over for electrodes
- (vii) Pre-heating arrangement for crossing body(torch)
- (viii) Gauging equipment
- (ix) Chipping hammer, wire brush etc.
- (x) Protective clothing including hand gloves, apron, shoes etc.
- (xi) Welding hand shield
- (xii) Magnaflux kit
- (xiii) Dye penetration Testing kit
- (xiv) Tong tester
- (xv) Thermo chalks
- (xvi) Grinders/Hand grinding Machine,(Preferable electric angle grinder or straight grinder)
- (xvii) Hammer ball peen 1/2 kg weight.
- (xviii) Wire feeder in case of flux cored continuous wire welding process.

5.2 For Switch Expansion joints:

All equipment mentioned at para 5.1

5.3 For CMS Crossings:

- (i) All equipments mentioned at para 5.1 above except pre-heating arrangement for crossing body at Sl.No.(vii)
- (ii) A water tank made either masonry or steel plate walls of suitable size, which can accommodate a crossing.

6.0 Process of welding.

6.1 Medium Manganese steel or 90UTS Pts. & Xings (in depot):

6.2 Surface preparation:

The location to be reconditioned shall be ground by pneumatic or Electrical grinder to remove adherent scales, deformed and work Hardened metal and surface cracks. Complete removal of the surface cracks is necessary as any leftover crack on the surface may extend due to contraction of the weld deposit during cooling and cause premature failure of the crossings in service. After grinding the locations to be welded shall be tested by magnaflux or dye-penetrant methods to ensure freedom from cracks.

6.3 Electrodes to be used and precautions taken.

Electrodes approved under H3 series of the approved list issued by RDSO shall only be used. Low hydrogen type of electrodes shall be dried at 130oC to 170oC for at least one hour immediately before use. Incase, the packing of electrodes is absolutely intact and all the electrodes are consumed within 06(six) hours after opening of the packing, then preheating of electrodes may be dispensed with. During use of this type of electrodes, care is to be taken to use shortest possible arc and minimum weaving. Current polarity, angle of electrode and welding technique as recommended by the manufacture of the electrode shall be used. Welding shall be done using 4mm dia electrodes only to avoid high heat input. Electrodes having cracked and damaged flux covering shall be discarded. The electrodes shall be stored in accordance with the directions laid shown in para 11.2 of IS: 814-1994, the extract of which is appended below.

11.2 “Electrodes shall be suitable packed to guard against damage during transportation. The packing shall be suitable to ensure that under normal store room conditions the electrodes shall for period of at least 6 months after the dispatch from the manufacturer's stores, be capable of giving results in accordance with the provisions of the specification. If the flux covering is of a type requiring special protection during storage, the details and reference to this should be included in the marking of bundle or box of electrodes, the electrodes shall be stored in a dry store room”.

6.4 Welding sequence:

6.4.1 To avoid distortion, weld metal shall be deposited following a proper sequence so as to achieve uniform welding as well as low heat input. The runs shall be deposited in turn on the right wing rail, nose and left rail as per RDSO/Lucknow. In case of switches, stock rail should be reconditioned before the tongue rail.

Example for welding sequence:

In case skip welding is started from right wing rail, sequence will be in the order as under:

Set A-Right wing rail (RWR)-I, Nose-II and Left wing Rail (LWR)-III

Set B-RWR-I Nose-II, and LWR-III

Set C-RWR-I, Nose-II, and LWR-III and so on.

Similarly, if skip welding is started from left wing rail, the sequence will be as follows:

Set A-Left wing rail -III, Nose-II and Right wing Rail-I

Set B-LWR-III, Nose-II, and RWR-I

Set C-LWR-III, Nose-II, and RWR-I and so on.

A sample sequence of this process is as per RDSO/Lucknow.

6.4.2 A worn out tongue rail shall be reconditioned in the closed position i.e., resting against the stock rail. In case of a broken toe, however, the tongue rail is to be built-up initially and hammer forged in the open position and there after the tongue rail shall be close with the stock rail to attain the final profile.

6.5 Welding plant & Accessories:

6.5.1 DC or AC are welding plant shall be used. Instruments, cables and the accessories shall conform to the requirements of the relevant Indian Standards wherever available. Their capacity shall be adequate for the welding procedure laid down. All welding plants shall be maintained in good working order.

6.5.2 All electrical appliances required with the welding plant shall be properly earthed.

6.5.3 Means for measuring the current (tong tester) shall be available in addition to the current setting panel integrated with the welding plant as the actual output of welding current may not be equal to the current as set on the control panel in many classes, especially when the plant becomes old.

6.6 Pre-heating.

The points and crossings shall be pre-heated by oxy-acetylene flame to a temperature between 250oC to 300oC before welding. This temperature shall be maintained throughout the welding operation. If welding is to be interrupted for some reason, then the portions to be reclaimed subsequently shall be preheated again to the above temperature range before welding is continued. The pre-heating and interpass temperature shall be measured either by contact type pyrometer or tempil stick. No post heat-treatment is required after welding.

6.7 Current condition:

The current range as recommended by the manufacture for the particular brands of electrode selected for welding shall be used.

6.8 Welding operation:

Welding shall be carried out in the flat position following the welding sequence as mentioned in para 6.1.4.1. They are shall be struck on the points/crossing and then the electrode shall be progressively advance by maintaining they are using uniform movement. Care shall be taken to fill the crater to the full weld size before breaking they are to avoid formation of crater cracks. During re-start of the welding operation, they are shall be struck ahead of the crater and then drawn back. Slag shall be removed thoroughly in between runs. Depending on the depth of wear, the number of layers to be deposited shall be assessed and sufficient weld metal shall be deposited to provide as excess of weld metal by about 3mm which finally be finished by grinding. An interpass temperature of 250oC to 300oC shall be maintained throughout during the welding operation.

6.1.9 Welding operation.

After completion of welding, reconditioned area shall be ground off in accordance with the original contour of the rail. A straight edge along with a proper template may be used to check the profile after finish grinding. During grinding, the grinding wheel shall be moved back and for the over the area and not stopped at one stop to avoid high –localized heating and cooling, which may result into formation of grinding cracks. The grinding wheel shall be kept properly dressed to have a clean cutting surface, as a smoothened and loaded face will increase frictional heat and proneness to grinding cracks.

7.0 MEDIUM MANGANESE STEEL OR 90 UTS POINTS & CROSSINGS (In Situ):

7.1.1 History of the crossing:

Before start of welding, the history of the crossing shall be collected and recorded on a card or register. The details to be recorded shall be as indicated in para 7.1.9

7.1.2 Wear pattern.

The wear pattern shall be recorded along with depth of wear measured at ten different locations marked as per RDSO/Lucknow.

7.1.3 Grinding.

The work hardened, fatigued and loose metal if any, shall be removed by minimum grinding. Cracks if any shall be completely removed by grinding and then the surface shall be tested by magnetic particles or by dye-penetrant test. In case, deep cracks are present, the same may be removed first by special cutting electrode followed by grinding.

7.1.4 Electrodes.

Only RDSO approved H3 series of electrodes of double electrode system shall be used.

7.1.5 Pre-heating.

The tongue rail or nose and wing rails of MM/90 UTS steel be preheated on the surface by to and fro play of oxy-acetylene torch so that a rail temperature of 250oC (approx) is maintained when depositing the weld metal. Once welding continues, blowpipe can be withdrawn and the welding process will itself sustain the inter pass temperature of 250oC.

7.1.6 The crossing shall be welded following proper weld sequence for ensuring uniform and minimum heat input. For this purpose, weld metal shall be deposited alternatively on left wing rail nose and then right wing rail. Lower side of the recommended current range shall be used with shortest possible arc. Weaving may be carried out but it should be minimum. Slag inclusion shall be removed by suitable hardwire brush having three rows of bristles on 25mm width and suitable hardened chipping hammer having pointed and flat ends. Incase DC-welding is recommended polarity. After completion of welding, reclaimed area shall be carefully checked for presence of sufficient metal at each point and presence of any weld defects. Undercut, groove or any other defect, if noticed, shall be removed immediately by electrode cutting followed by re-welding when the crossings still remain hot. Only 4.0mm dia electrode shall be used and in rainy season, such electrode shall be preheated at 130oC -170oC for at least one hour immediately before use. Incase, the packing of electrodes is absolutely intact and the entire electrode are consumed within 06 (six) hours after opening of the packing, preheating of the electrodes may be dispensed with.

7.1.7 Welding generator.

Diesel/Petrol – driven portable welding generator shall be used for in-situ welding. It should be capable of supplying 200 amperes at 6% duty cycles as mentioned in.

7.1.8 Passage of train.

Trains can be passed at normal speed over the weld-metal on crossing even before completion of the hard facing operation. After passage of the train, welding can be started again. However, the weld metal should be allowed to cool for a period of 2 to 3 minutes before allowing the passage of train.

7.1.9 Records.

For each crossing, records shall be maintained at SE/PW's office showing station, point no. up/down line, facing/trailing direction, traffic density, angles, UTS(72/90), date of last resurfacing, traffic carried since then, date of present, resurfacing, wear readings, (depth in mm) at locations as per RDSO/Lucknow on left wing rail, nose, right-wing rail, brand and size of electrode used, quantity of electrode consumed (in Nos. or Kg) grinding time, welding time, total time taken, no of trains passed during welding and name of welders. (Performa given as per RDSO/Lucknow should be used for this purpose).

- (i) Station
- (ii) Sr No of Crossing
- (iii) Make
- (iv) Angle/gauge/section/sleeper type
- (v) Laying date and traffic carried Particulars(GMT)

	Particulars	New crossing	After Ist recond	After IIInd recond	After IIIrd recond	After IVth recond
a	Point No					
b	Line(UP/DN)					
c	Direction of traffic (Facing/Trailing)					
d*	Date of laying					
e*	Date of removal					
h	Traffic density of section (GMT)					
i	Traffic carried since last reconditioned (GMT)					
j	Cumulative Traffic carried (GMT)					

(vi)	Wear and welding particulars Particulars	After Ist recond	After IIInd recond	After IIIrd recond	After IVth recond
a	Wear on nose when released from track (100mm away from ANC)				
b	Wear on nose after surface preparation (100mm away from ANC)				
c	Date of reconditioning				
d	Technique of welding				
	i) Whether depot or in-situ				
	ii) Whether single electrode or continuous wire process				
e	Brands of electrodes used				
f	Qty of electrodes consumed				
g	Remarks				

These records shall be diligently maintained so that these can be used to monitor/improvethe productivity/quality of work of the welder.

Signature of SSE/P Way

* Note: In case of reconditioning being done in-situ, the col 5(d) & (e) will be replaced by date of reconditioning

7.2 Switch Expansion Joints:

The worn out tongue and stock rails of SEJ may be reconditioned by welding as per requirements of field officials. It will be preferable to do reconditioning of SEJs in- situ to avoid de-stressing of LWR panel. The process as recommended for reconditioning of MM steel 90/UTS points & Crossings at para 6.1 or 7.0 above shall be followed.

7.3 Austenitic Manganese Steel Crossing (CMS Crossing)

7.3.1 Surface preparation.

The portions to be reclaimed shall be ground by pneumatic or electrical grinder to remove all work hardened metal, spalled edges, cracks, adherent scales etc. it shall be ensured that before welding, all surface cracks have been removed, as any left over crack on the surface may extend due to contraction of the weld deposit during cooling and cause premature failure of the crossing in service. After grinding, the locations to be welded shall be tested by dye-penetrant method to ensure freedom from cracks. The consumables should comply with RDSO specifications. Being non-magnetic steel, Magnaflux testing is not applicable.

7.3.2 Electrodes to be used and precautions taken.

The electrodes approved under H3 series of the approved list issued by RDSO shall be used. The electrodes shall be dried at the specified temperature as recommended by the manufacturer. Welding shall generally be done using 4.0 mm dia. Electrodes to avoid high heat input. The electrodes having cracked and damaged flux covering shall be discarded. The electrodes shall be stored in accordance with the directions laid down in IS: 814-1994 as explained in para 6.3

7.3.3 Welding sequence

Rectification of defects by welding of Austenitic Manganese Steel Crossings requires great care in reducing the heat input. The cycle shall be short i.e., not more than two minutes at a time and on no occasion more than one run shall be deposited. It is advisable to follow skip welding sequence or to weld different portions of the crossings by rotation keeping the intervals adequate to ensure that the temperature of the adjoining areas remain below 150oC. The runs may preferable be deposited in turn on the right wing rail, nose and left wing rail in case of crossings following a skip sequence as explained in para 6.1.4.1.

7.3.4 Welding plant and accessories.

The welding plant, accessories and precautions, during their use shall be same as mentioned in para 7.3.2 & 6.1.5. However, DC Generator with reversed polarity will be preferable.

7.3.5 Pre-heating.

Due to its low thermal conductivity and possibility of brittle structure formation, it is not advisable to pre-heat the crossings before welding as done in case of medium manganese steel or 90 UTS points & Crossings. Interpass temperature shall always be maintained below 150oC by keeping adequate intervals in between the run and cooling the weld deposit and heat affected zone by means of compressed air jet or water quenching immediately after welding. Alternatively the crossings may be kept submerged in water bath (water tank made of either masonry or steel plate wall) so that only top 1 cm of the crossing remains above the water level. The interpass temperature shall be measured either by contact type pyrometer or tempil stick. No post-heat treatment is required after welding.

7.3.6 Current Conditions.

Welding shall normally be carried out with the reversed polarity to minimize vibration and heating of the coating or as recommended by the electrode manufacturers. Current on the lower side of the recommended range and short arc length shall be used to reduce the heat input in the

base metal, thereby reducing the dilution of the weld metal with the base metal, which would otherwise cause embitterment in the weld.

7.3.7 Welding operation.

Welding shall be carried out in the flat position following the sequence as recommended in para 6.1.8 except that at no stage the temperature of crossing shall be allowed to go beyond 150°C. They are shall be struck on the crossing and then the electrode shall be progressively advanced by maintaining they are with uniform movement. At a time, a run of about 7 to 8cm length only shall be deposited by using weaving technique with the electrode held at 45 degree angle to the direction of welding. The width of the bead shall be twice the diameter of the electrodes and the arc length approximately equal to the electrode diameter. Care shall be taken to fill the crater and then drawn back. Slag shall be removed thoroughly in between the runs. Depending on the depth of wear, the number of layers to be deposited shall be assessed and sufficient weld metal shall be deposited to provide an excess of the weld deposit of about 3.0mm which shall finally be finished by grinding.

7.3.8 Grinding Operation

After completion of welding, the reconditioned areas shall be finished by grinding to obtain a smooth surface. The sharp edges along the flange-way shall be ground to proper radius and profile with the help of templates, so as to match with the original contour of the rail. A straight edge along with a proper gauge may be used to check the profile after finish grinding. During grinding, water shall be sprayed frequently and the grinding wheel shall be moved back and forth over the whole area and not stopped at one spot so as to avoid high localized heating and cooling which may form grinding cracks. The grinding wheel shall be kept properly dressed to have a clean cutting surface, as a smoothened and loaded face will increase frictional heat and proneness to grinding cracks.

7.3.9. Welding Site.

Austenitic Manganese steel contains high percentage of alloy elements (Manganese 11-14% Carbon 1-1.4%) and also has lower thermal conductivity. As such, it requires special welding procedure and precautions for obtaining crack free weld deposit on them. The process needs cooling of the weld deposit intermittently by water or compressed air to maintain the temperature below 150°C thereby requiring longer time for welding. In view of this, it will be advisable to weld such crossings in a depot.

7.3.10. All points and crossings, switches and SEJs after reconditioning at inspection shall be thoroughly cleaned of rust, scales etc. by brushing/mechanical cleaning and painted as given below:

1. One coat of ready mixed zinc chrome paint to IS 104-1988 followed by one coat of ready mixed paint zinc chrome primer to IS 2074-1989 or two coats of ready mixed red oxide zinc chrome primer to IS 2074-1989.
2. Finishing coat of ready mixed paint VERDIGIL GREEN TO ISC 280 to IS 117-1998.
3. The thickness of the complete system of paint shall not be less than 80 microns (IRS T-10-2000)

7.3.11 All reconditioning component with crossing, switches and SEJs after final painting shall be marked with contractors initials, agreement number, month and year of reconditioning by stenciling in 50mm size with paint on the web portion of the switch/crossing SEJ.

7.4 Precautions in Metal Arc Welding

The welding arc is a point of intense heat, it emits harmful Ultraviolet and infrared rays and fumes which may cause inconvenience to the welder. Hot metal, slag and spatter can often be hazardous to the operators. Adequate precautions are, therefore, required to safeguard from:

- (i) Electric shock
- (ii) Radiation from the arc
- (iii) Scattering hot particles and globules of metal and slag.
- (iv) Flying pieces of sharp slag when being chipped.
- (v) Heat and fumes.

8.0 Testing and Inspection

8.1 The resurfaced points and crossings after cooling and finish grinding shall be subjected to a visual inspection, dimensional measurement and freedom from the presence of any surface defects during welding i.e. under profile cut, slag inclusion, porosity, cracks etc. The finished dimension after recondition should be as for new switch/ Crossing/SEJ.

8.2 The points and crossings found to be free from any defect during visual examination shall be subjected to magnaflux or dye-penetrant test to ensure freedom from the presence of any surface crack which may not be detected during visual examination. The details of the magnaflux and dye-penetrant tests.

8.3 Rectification of defects after testing and inspection.

During visual inspection and magnaflux and/or dye-penetrant tests, cracks or other weld defects are found, the portion containing the defects shall be gauged either by pneumatic gauging or grinding and the remaining portion shall be re-examined by dye-penetrant tests for ascertaining free from any crack or defect before under taking further repair. In the absence of any crack. The portion shall be re-welded, ground and inspected by following the recommendations as mentioned above.

8.4 Periodical Inspection.

After laying in track, the resurfaced points & crossing shall be inspected quarterly in order to record the amount of wear on the nose, left wing and right wing rail as well as stock and tongue rail and also for the structural soundness, presence of dis-integration or only other defects. Wear shall be recorded in crossing at ten different locations marked (A1, A3, B1, B3, C1, C2, C3, D1, D2 & D3) as per RDSO/Lucknow and in tongue rails at seven different locations starting from one at toe to places each 100m away towards heel side and up to 600mm from the toe. prescribed minimum GMT for the class of electrode used the recovery shall be made at twice the accepted rate from the security deposit/ guarantee money lodged with railway.

9.0 Recoveries

If the reconditioned switch/crossing/SEJ fails after laying in the track before achieving the prescribed minimum GMT for the class of electrode used the recovery shall be made at twice the accepted rate from the security deposit/ guarantee money lodged with railway

9.1 The welding electrode of 4mm dia having valid and current approval as prescribed by RDSO under H3 series shall be arranged by the contractor. The contractor will have to produce documentary proof of having procured the approved brand of electrode from authorized stockiest duly supported by necessary test certificate issued by the manufacturer of the electrode. The approved list of manufacturers issued by RDSO is subject to revision every year. The contractor shall procure welding electrode from the current list approved by the RDSO for manufacturing of these electrodes.

9.2 Responsibility of obtaining of materials, plants, machineries required for the performance of the contractor shall entirely rests with the contractor.

10.0 The rate of reconditioning work shall be inclusive of cost of labour, materials, consumables, tools and plants for finishing and machinery etc. including reassembling of the crossing in case of built up crossings complete for the above. The accepted rate is deemed to include cost of all incidental works including lead and lift.

10.1 The work shall be carried out as per the Railway standard drawing, provision in Indian Railway Permanent Way Manual, Track Manual and standard Technical Requirement explained in the special specifications attached with the contract. The work shall be carried out by a qualified/certified welder as required in the special conditions.

11.0 An amount equal to 10% of the bill amount will be retained as Guarantee money for a period of one year or passage of 50 GMT whichever is earlier as performance guarantee which will be refunded to the contractor subject to the deduction admissible under the contract on completion of the above period.

12.0 No electricity/power connection will be provided by the Railways for execution of the work under the contract and the contractor shall make arrangements for necessary power connection/generator at his own cost at the site of work. However in case, electric supply is available nearby from Railway source, it can be spared at the sole discretion of the Railway on payment of energy charges as prescribed by Divisional Electric Engineer. However, necessary arrangements for connection/cable metering etc. shall be done by the contractor at his own cost and he will be responsible for safety of men and materials.

III. Procedure for Reclamation of Railway Crossings using Two Electrode System CP BUFFER 040 (Buffer Layer) & CP TOP 080(Hard Surfacing Layer)

1. General:

1.1 The clauses below cover the procedure to be adopted for repair of MMS & CMS points & crossings, using electrodes CP Buffer 040 (Buffer layer) & CP TOP 080 (Hard surfacing layer).

2. Welding Power Source:

2.1 A standard D.C. set with 80 OCV or standard A.C. set with 90 OCV.

3. Preparation of work:

3.1 Work-hardened, deformed, spalled, chipped & cracked material must be removed from the old crossing by mechanical grinding, till sound & bright rail material is exposed. No rust is permitted on areas to be welded.

3.2 Ensure grinding operation with light pressure, to avoid localized overheating.

3.3 Only mechanical grinding is to be used for material removal. Flame or arc gouging must not be used under any circumstances.

3.4 Standard Dye Penetrant Test to be carried out prior to welding, to confirm absence of structural defects in the rail material. Thereafter, thoroughly clean all surfaces to be welded, by using a residue-less solvent (such as Acetone).

4. Steps for repair:

4.1.1 Built-up Crossings:

Pre-heat the areas to be repaired+3 inches on either side to approx. 100oC. Check the temperature with indicating crayons. Use fresh electrodes(less than 1 year old) from sealed dripack. Remove only consumption quantity of electrodes at a time from the dripack. Dripack should be promptly closed thereafter. Electrodes are to be used for welding only after drying at 150oC for 60 minutes.

4.1.2 CMS Crossing:

NO PREHEATING TO BE DONE:

CMS crossing to be immersed on running water. Only 2 -3 mm portion where welding has to be done should be projected out of water. Interpass temperature is to be maintained around 100oC.

4.2 The built up is carried out in 2 stages. First layer (buffer layer) is to be deposited using CP BUFFER 040 – 3.15 mm. Subsequently, 3 layers (hard-surfacing layers) are to be deposited, using CP TOP 080 – 4mm. The total built up (buffer + top) will be approx. 10-12mm

5. Deposition of buffer layer with CP Buffer 040:

5.1 Using D.C (electrode positive) or A.C. power source & suitable current setting (100-130 Amps at electrode holder during welding), deposit stringer beads with short arc length. Use of calibrated portable A.C. /D.C. Tong Tester is recommended to ensure correct electrical parameters. Maintain interpass temperature 100oC -150oC throughout the welding. Each deposited bead should be thoroughly de-slagged & wire brushed, prior to deposition of next bead.

5.2 Peen the deposit to relieve welding stresses. Ensure that welded surfaces are coated uniformly with weld metal of CP Buffer 040 & perfectly ready for depositing further buildup with CP TOP 080.

6. Deposition of hard-surfacing layer with CP TOP 080:

6.1 Using D.C. (electrode positive) or A.C. power source & suitable current setting (120-160 Amps at electrode holder during welding), deposit stringer beads with short arc length. Use of calibrated portable A.C. / D.C. Tong Tester is recommended to ensure correct electrical parameters. Maintain interpass temperature 100oC-150oC throughout the welding. Each deposited bead should be thoroughly de-slagged & wire brushed, prior to deposition of next bead.

6.2 Peen the deposit to relieve welding stresses.

6.3 Continue welding in identical manner till total build up of 10-12 mm is satisfactorily achieved (buffer + hard-surfacing layers).

6.4 After completing welding, cover the welded region + 6 inches on either side by dry Mild Steel sheet or any other suitable cover, to protect from cold air drafts & rain. Allow to cool in still air.

7. Finishing:

7.1 Shape the weld deposit by light grinding, preventing localized heat build up.

7.2 Any sharp or under-filled portion should be filled up by CP TOP 080, using procedure described in para 6.

8. Post-weld Testing:

Standard Dye Penetrant Test should be carried out over the weld-repaired area as well as on base material up to 6 inches metal on either side. Railhead side should also be DP tested.

9. Repair:

Repair defects, if any, using procedure described in para 6

10. Important Note:

10.1 Welding should be done by laying wing rails & nose in close proximity.

10.2 Welding should be done from start to finish on left wing rail, followed by complete welding on the right wing rail. Thereafter, nose portion should be finally completed.

10.3 To achieve the best quality welding & to ensure stipulated service life, described procedure must be adhered very strictly.

IV. Special Conditions For Track And Bridge Works On Electrified Sections

Maintenance in Electrified Areas

1. General Instructions to Staff - (1) General Knowledge of Engineering Staff –

(a) Every Engineering Official working in electrical traction area shall be in possession of a copy of rules framed for the purpose of the operation of the Traction Power Distribution system pertaining to Engineering Department and ensure that staff working under him is also acquainted with the rules. He will ensure that rules pertaining to carrying out engineering works are strictly observed.

(b) All electrical equipment, every power line or cable shall be regarded as being 'live' at all times. No work shall be commenced adjacent to any electrical equipment except on authority issued in writing by a competent official of the Electrical Department to the effect that the equipment has been made dead and earthed.

(2) Defects in a Overhead Equipment: -

Defects or break-downs in the overhead equipment including track and structure bonds noticed by the Engineering staff shall be reported immediately to the Traction Power Controller. When defects in the overhead equipment that are likely to cause damage to pantographs or trains, are noticed and it is not possible to convey information to Station Masters or signalmen to enable them to issue caution orders, the line shall be protected by the staff noticing such defects according to **General Rule 3.62.**

(3) Traction Bonds –

In electrified areas the return current fully or partially flows through the rail. To ensure a reliable electrical circuit continuity and also to ensure proper earthing in case of leakage of current, various types of traction bonds as described below are provided at suitable places and maintained by the Electrical Traction Department –

(a) *Longitudinal Rail Bonds* -- In the case of DC traction system, practically the whole return current flows through the rail. Therefore, two flexible copper bonds offering minimum resistance to the flow of current are provided at each rail joint under the fish plates. Two solid lugs at the two ends of the copper bonds are inserted in holes drilled at the two rail ends between the fish bolt holes and are pressed by using a bend press to rivet them firmly to the rail. On points and crossings and at junction fish-plates where continuity bonds of the above type can not be provided due to space constraint, continuity of return current path is achieved by using mild steel straps or G.I.Wire ropes. Absence of such bonds may cause unsafe working condition and in extreme cases may damage the rail ends.

(b) Cross Bonds (D.C) –

Cross bonds are provided between adjacent tracks at regular intervals to reduce resistance of the current to the minimum. Such cross bonds are also known as transverse bonds.

(c) Structure Bond :-

All structures supporting overhead equipment either in A.C or D.C track circuited areas are connected to the running rails for ensuring good earthing. Failure of insulator or leakage of current switches off the supply from the sub-station so that men coming in contact with supporting structure etc. do not get electric shock. Removal or tampering of such bonds can, therefore, result in unsafe conditions. Since the structures are grouted in concrete, they are likely to become charged in case such bonds are kept disconnected. Similarly other steel structures such as foot over bridges, sheds etc., in the vicinity of O.H.E. lines are also connected to rails through similar structure bonds.

4. Special Instructions to Staff Working in Traction Area -

(1) *Need for precautions* - Precautions are required to be taken on account of following:-

(b) *Build up of potential due to return current in rails* - The return current in the rails may cause a potential difference –

- i) Between rail and the surrounding mass of earth
- ii) Between two ends of fractured rail.
- iii) Between the two rails at an insulated joint.
- iv) Between earth and any other metallic mass.

(2) The following precautions should, therefore, be taken while working in traction areas:-

(a) No work shall be done within a distance of two metres from the live parts of the O.H.E. without a 'permit-to-work'.

(b) For work adjacent to overhead equipment the Engineering Inspector shall apply to the proper authority sufficiently in advance for sanctioning the traffic and power block required. The Traction Power Controller through Traction Foreman will arrange to isolate and earth the section concerned on the date and at the time specified in consultation with the Traffic Controller. He shall then issue 'permit-to work' to the Engineering Inspector. On completion of the work the 'Permit-to-work' should be cancelled and Traction power controller advised, who will then arrange to remove the earth and restore power supply.

(c) *Alterations to Track bonding*:- All bonds removed by the staff of the Engineering Department shall be replaced by the staff of the Engineering Department and all such removals and replacements shall be reported to the Assistant Electrical Engineer, Track Distribution in charge, concerned without delay.

(d) Steel tapes or metallic tapes with woven metal reinforcement should not be used in electrified tracks. Linen tapes are safer and, therefore, should be used even though they are not accurate.

5. Maintaining continuity of Track –

(a) During maintenance or renewal of track, continuity of the rails serving electrified tracks shall invariably be maintained. For bridging gaps which may be caused during removal of fish plates or rails, temporary metallic jumpers of approved design shall be provided as under. The necessary jumper will be provided by the Electrical Department on requisition.

(b) In case of rail fracture, the two ends of the fractured rail shall be first temporarily connected by a temporary metallic jumper of approved design. In all cases of discontinuity of rails, the two parts of the rail shall not be touched with bare hands, Gloves of approved quality shall be used.

(c) In the case of track renewals temporary connection shall be made as shown in Annexure 2/17.

(d) In the case of defective or broken rail bond, temporary connections shall be made as shown in sub-para (2) above.

(e) Before fish-plates are loosened or removed temporary connection shall be made in as in sub-para (3) above.

7. Additional precautions in A.C. Traction area - The following additional precautions are required to be taken in AC traction areas:

(a) Permanent way staff are advised to keep clear of the tracks and avoid contact with the rails when an electrically hauled train is within 250m.

8. Fire in electrified areas - The Permanent Way Officials noticing a fire likely to result in loss of life or cause damage to property shall take all possible steps to prevent it from spreading and

to extinguish it. In case the fire is on adjacent to any electrified equipment, the Permanent Way Official shall make no attempt to extinguish the fire but shall report the occurrence of fire to the nearest Station Master by most expeditious means.

9. Permanent Way Tools - Permanent Way tools (Insulated and uninsulated) along with gloves shall be used in manner as approved by the Chief Engineer of the Railway.

10. Treatment of persons suffering from Electric shock - When persons receive electric shock, practically in every case they can be revived with prompt application of First-Aid.

Method of Resuscitation - The method of resuscitation resorted to should be that known as artificial respiration.

Continuity of Treatment - The efforts to restore breathing must be continued regularly and with perseverance, and must not be discontinued until a Doctor has taken charge of the case.

16. Safe working of Contractors - A large number of men and machinery are deployed by the contractors for track renewals, gauge conversions, doublings, bridge rebuilding etc., It is therefore essential that adequate safety measures are taken for safety of the trains as well as the work force. The following measures should invariably be adopted.

(a) The contractor shall not start any work without the presence of Railway supervisor at site.

(b) Wherever the road vehicles and/ or machinery are required to work in the close vicinity of Railway line, the work shall be so carried out that there is no infringement to the Railway's schedule of dimensions. For this purpose the area where road vehicles and/ or machinery are required to ply, shall be demarcated and acknowledged by the contractor. Special care shall be taken for turning/reversal of road vehicles/machinery without infringing the running track. Barricading shall be provided wherever justified and feasible as per site conditions.

(c) The look out and whistle caution orders shall be issued to the trains and speed restrictions imposed where considered necessary. Suitable flagmen/ detonators shall be provided where necessary for protection of trains.

(d) The supervisor/workmen should be counseled about safety measures. A competency certificate to the contractor's supervisor as per proforma annexed shall be issued by AEN which will be valid only for the work for which it has been issued. (Annexure 8/5).

(e) The unloaded ballast/ rails/sleepers/other P.Way materials after unloading along track should be kept clear off moving dimensions and stacked as per the specified heights and distance from the running track.

(f) Supplementary site specific instructions, wherever considered necessary, shall be issued by the Engineer in charge.