

SPECIAL CONDITIONS FOR SKV WELDING

1. The actual Kilometres and the time limit for completing the work against the contract executed will be issued by the Divisional Engineer/AENs from time to time during the period of currency of the contract and the contractor shall execute the work at the rates and conditions specified in the contract and within the time schedule as may be stipulated in such work orders.
2. The work should be completed within the specified period and the completion period will take effect from the date of acceptance of the tender.
 - (a) Arrangement should be made to progress the work in all the sections to be indicated by the Divisional Engineer/ AEN.
 - (b) Planning of welded joints must keep pace, with welding and in no case shall fall behind by more than 60 joints at site.
3. The work shall be carried out in accordance with IRS Specification No.T-19-94 fusion welding of rails by SKV Process. A copy of these specifications is attached as Annexure-I . All conditions laid down therein shall apply to this except as modified or clarified herein-under.
4. The contractor should satisfy himself from time to time about the metallurgical property of the rails to be welded and apply the correct technique for producing satisfactory welded joints from such rails.
5. The test for assessing the quality of the portions as per section of the Railway's Specifications will be carried out at the contractor's workshop in the presence of the Inspecting Officers deputed by the RDSO Lucknow.
6. The tests as specified in section 12 of the Railway Board's Specification will be arranged by the Railway at such places as they may decide.
7. Initial USFD testing should be conducted within a month's time from the date of welding so that the welder with a bad workmanship can be identified and removed from the site
8. In case the defective weld exceeds 4%, the certificate issued by RDSO should be cancelled and welder will have to go through with the process of re-certification. Till fresh certification is issued welder should not be allowed to do any work on the track.
9. A penalty of Rs.1000/- per weld beyond 1% defective weld/fracture during the guarantee period will be levied and Rs.2000/- per weld is to be levied for defective/fracture beyond 2.5%. This penalty will be in addition to '*Free re-weld after cutting the defective welds*'.
10. A joint checking will be conducted with firm's representative to detect the percentage of defective welds in comparison to what has been detected earlier by PWI/USFD.
11. The firm shall do the welding of defective weld by wider gap technology at same cost of original weld. This will reduce the wastage of rail and population of additional SKV weld at site.
12. Numbering of SKV weld at site should be done to co-relate a particular weld with a particular batch of portion and welder.
13. Regular welding during the winter months should be avoided or is to be done in rising temperature. In case the situation demands to do the welding in falling temperature specially during winter, tensors are to be used to maintain the gap for ensuring good weld.
14. 1% percent sample joint testing as envisaged in the Manual (Para-7.1 of Manual for Fusion Welding of Rails by Alumino Thermit Process, vide Annexure-I) to be strictly followed.
15. The Railway will make available on payment and if required by the contractor rail pieces for making test welds, specified in Clause 7.1 of the Annexure-I.
16. A guarantee as specified in Clause 15.1 of Annexure-I shall be furnished by the contractor at the time of final bill .

17. The marking of welded joints as specified in clause 16.1.2 & 17.1 of the Annexure-I shall be done by the contractor at his cost.
18. The contractor shall procure all the necessary welding materials as well as all the equipments for the welding works as to produce a finished weld including the necessary planning equipments at his own cost and he will be paid only for the finished work at rates quoted in the schedule of items.
19. The Railway shall provide all labour required for the work. The contractor shall arrange to train the labour in the welding technique and shall also be responsible for providing constant technical supervision during the progress of the works. The Railway will provide the contractor with 1(One) set 1st class card pass available between Contractor's Factory/Store to Dhanbad and from any station to any station within Dhanbad Division to cover the contract period.
20. The contractors shall be responsible for the correct alignment and welding of the rails and for the proper aligning by trimming of the welds and their finish. The weld trimmer to be supplied by the contractor at his cost.
21. (a) The Railway will arrange to lay the rails in tracks necessary before welding to enable the contractor to align them correctly.
(b) The Railway will arrange to provide the rail in tracks necessary before welding to enable the contractor to align them correctly.
22. The Railway shall provide pieces of wooden sleepers wedges and such other tools which are required for lifting or making or placing the rails in position for welding purposes and also hammer and hot and cold sets required for the work.
23. (a) The contractor shall supply the required welding plant and welding mixture suitable for 52Kg(MM)/52Kg 90UTS/ 60Kg 90UTS rails with complimentary and incidental materials required for work including molding and luting sand. The end of rails will be cut by Railway Administration as and when necessary and the rails laid out in the proper sequence.
(b) The Railway shall provide free of cost fuel like petrol for heating purpose in welding. The requirement of petrol for welding of SKV process is as under which will be supplied by Railway free of cost:-
 - i) for 52Kg. rail = 1.60 litre. Per joint.
 - ii) for 60 Kg. rail = 1.80 Litre per joint.
 - iii) for 90 R Rail = 1.50 Litre per joint.All other equipments used by the contractor in grinding or planning etc., should be worked out by him at his own cost but labour for this work will also be supplied by the Railway free of cost.
24. The Railway shall provide to the contractor with trolleys for trolleying out of all plant and equipments and materials from nearest Railway Station to the site of works. The supervisory staff of the contractor will also be carried out on push trolley free of cost. However the supervisors will have to follow the extent rule of the Railway and will fill up Indemnity Bond before being carried out on the Railway Push Trolley.
25. The Railway shall assist the contractor in providing storages accommodation for his plant and materials free of charge as close to the site of works as possible in pucca structure whenever possible. In case pucca accommodation is not available tents or tarpaulins, sufficient to hold all welding materials and charger and plant etc. will be provided by the Railway.
26. The Railway would provide a quarter and if the same is not available thereon suitable tent for the use of the contractor's supervisor as near the site of work as possible.

27. The Railway will issue credit notes to cover the freight charges on the transport of plant and equipments, welding mixtures and all other materials required for the work from the contractor's Head quarters station to the nearest station adjacent to the site of work. The Railway will issue credit notes to cover the Railway freight charges on the transport of contractor's plant and equipments and upto 5% of the total quantities of their materials if left over at the close of the works, back to their headquarters station or any other station within the same distance.
28. The contractor shall not carry out any work between sun set and sunrise. He should take his own arrangement to protect the work against wind and weather in the course of execution.
29. Payment shall be made for acceptable joints in terms of this agreement. No payment will be made for the test joints, but labour, petrol and rails for the welding of these test joints would be supplied free by the Railway.
30. No payment shall be made by the Railway for test joints which may be allowed to be done for improving the welding technique in terms of Clause 16.1.1 Annexure-I.
31. If any foreign exchange is involved the contractor shall make his own arrangement for arranging import license etc. and the Railway shall not be liable to arrange and tender any assistance on this.
32. The contractor shall be responsible for the welded joints remaining satisfactory for the guarantee periods as specified in Annexure-I and every joints failing during the period 3 times the cost of one weld will be recovered from the amount due to him, if it is decided by the Railway that the cracked welded joint will not be re-welded free of cost by the contractor as specified in Clause 15.1 of Annexure-I.
33. The East Central Railway Engineering Department Hand Book General Conditions of contract 2008 and Standard Specifications, 2008 Edition with the upto-date correction slips, will apply to this contract except is so far as they are modified by the special conditions above.
34. The account of sealed approved portions and statement of issue of approved portion shall be maintained by the Railway representative i.e. the APWI In-charge of the welding but the account and statement in question will have to be countersigned by the authorised representative of the contractor. The accounts shall co-relate the welding panel or best piece numbers with the approved portion and the date of welding.
35. The contractor must abide by and comply with the provisions and rules of contract labour (Regulation and Abolition) Act, 1970 and Central Rules, 1971. The above will applicable only when the No. of labour/staff deputed by the firm exceed the laid down norms.
36. Petrol for heating purpose in the welding work shall not be issued to the contractor but the Railway staff supervising the welding work will use this fuel directly on the work and a responsible Railway staff will be nominated to keep proper accountal of petrol which will be used on the welding of 100 joints and from this the scale of consumption of fuel per joint shall be worked out and fixed. Petrol required for cleaning of joints shall be accounted for alongwith the total quantity of petrol required for welding of joints.
37. (I) The Railway takes responsibility of – Pulling out rails and/or cut rails for creating gap for welding the correct amount to be specified by the contractor.
 - (ii) Shifting sleepers, to insert wooden blocks and edges for alignment.
 - (iii) Pulling back rails and repack sleepers after welding.
 - (iv) Providing cut pieces after removing any spoil joint by cutting.
 - (v) Opening out fishplates bolts, nuts, keys and putting them back when necessary, and
 - (vi) Providing required quantity of petrol, labour for cleaning of joints free from grease under contractor's supervision.

- (Vii) Sales Tax where leviable if intended to be claimed from the purchasers should be distinctly shown along with the price quoted in which case the Rly. Administration accepts the liability for payment of Sales Tax provided however such tax is leviable under the existing laws on the supply of the items included in this contract by the contractors to the Railway Administration. The contractors must satisfy the Rly. Administration in this matter by producing the sales tax registration. Certificate to indicate that they are registered dealer for the purpose of assessment of Sales Tax. The actual payment of Sales Tax will be made as livable under rules for such supply. The contractor will be required to transmit actual payment so received in respect of sales tax relating to this contract as livable under the existing rules to the appropriate authority of the State Govt. concerned and furnish a certificate to the Rly. Administration to this effect. It is distinctly understood that standing anything contained in the tender documents and or the agreement the Rly. Administration shall not be found to final up the contractor to refund the security deposit even if the same is or has become otherwise refundable and to pay up or settle his dues in other respects until the contractors have furnished to the Rly. Admn. a certificate aforesaid where it is not clearly shown that the sales tax is to be claimed from the Railway, no claim for sales tax will be admitted in any later stage and on any ground whatsoever.
38. If the tender is accepted, the Earnest Money deposited by the contractor with his tender will be retained by the Railways as part of security for the due and faithful fulfillment of the contract by the contractor. The balance to make up the security deposit, the rate are which are given below, may be deposited by the contractor in cash or may be recovered by percent age deduction from the contractor's "On Account" bills. Provided also that in case of defaulting contractor the Railway may retain any amount due for payment to the contractor on the pending "on account bills" so that the amounts so retained may not exceed 10% of the total value of the contract.
- (i) Unless otherwise specified in the special conditions, if any, the Security Deposit / rate of recovery/ mode of recovery shall be as under:-
 - (a) Security Deposit for each work should be 5% of the contract value.
 - (b) The rate of recovery should be at the rate of 10% of the bill amount till the full security deposit is recovered.
 - © Security Deposits will be recovered only from the running bills of the contract and no other mode of collecting SD, such as SD in the form of instruments like BG, FD, etc. shall be accepted towards Security Deposit.
39. Security Deposit shall be returned to the contractor after the physical completion of the work as certified by the Competent Authority. The Competent Authority shall normally be the Authority who is competent to sign the contract. If this Competent Authority is of the rank lower than JA Grade, than a JA Grade Officer (Concerned with the work) should issue the certificate. The certificate, inter alia, should mention that the work has been completed in all respects and that all the contractual obligations have been fulfilled by the contractors and that there is no due from the contractors to Railways against the contract concern. Before releasing the SD, an unconditional and unequivocal no-claim certificate from the contractor concerned should be obtain.
40. The Earnest money deposited with the tender which is subsequent by converted into security deposit shall however by refunded to the contractor only on satisfactory compliance of condition No.5 at page 3 of the General conditions of contract 2008 and Standard Specification, 2008, on which the schedule of Rates, 2008, is based.
41. Railway will provide Credit Note for arranging dispatch of the materials from Contractor's Factory/ Store to any station where the materials required to be dispatched. In this regard Contractor may contact with concerned Asstt. Engineer of the Railway.
42. 80% advance payment will be made to the contractor on receipt of the materials, after acceptance of challan by PWI/AEN. Balance 20% will be paid after completion of work getting completion certificate in this regard from SSE/P. Way. The bill will be recorded in the M.B by concerned AEN for the work.

43. The contractor will have to bear all transporting charges including loading. Payment of all road/octroi taxes etc. . Only un-loading, stacking of materials will be done by the Railway free of cost. The rate quoted by the contractor shall include all such incidental cost & no extra charges for any such expenditure will be made.
44. The portion will have to be transported by the contractor from contractor's Factory/ Store to work site at his own cost. If any portion gets damaged during transportation from contractor's Factory/ Store to store of PWI or from PWI store to work site during un-loading from the truck etc. . No payment will be made for such damaged joint. Only if a portion gets damaged during un-loading by departmental team, the same will be paid for by the Railway @ 80%.
45. In case of emergency if Railway has to bring portions or consumables for contractor's Factory to store by arranging it on vehicle/ wagon etc. Railway will deduct a charge of 5% of the cost of portion.
46. One welding register & one site register in the proper format , duly initialed at every stage by Asstt. Engineer will be kept at site of work. Invariably after execution, details of welding location, batch No. etc. will be included in the welding register, site register in the proper format.

INDIAN RAILWAY STANDARD SPECIFICATION
FOR FUSION WELDING OF RAILS BY ALUMINO THERMIC PROCESS

Serial No.T-19-1994.

This specification is issued under the fixed serial No.T-19, the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

Adopted : 1961, First Revision : 1965

Second Revision : 1984

Third Revision : 1994

1. INTRODUCTION :

- 1.1 The soundness of the welds produced by Alumino Thermic Process depends on the quality of (a) Alumino-Thermic mixture hereinafter referred to as the "MIXTURE" and (b) the technical control exercised during the preparation for and the execution of the welding by this process.
- 1.2 The quantity of the "MIXTURE" required for welding one rail joint shall be called a "Portion".
- 1.3 A batch shall consist of a number of "portion" manufactured from similarly and simultaneously treat raw materials.
- 1.4 It is necessary to ensure that the "portions" are prepared under proper quality control and execution of the welds in the strict conformity with the practice by competent approved personnel for site welding of rails. No changes in the analysis of the mixture its acceptance tests and the methods of welding shall be made without the consent of the approving authority.

2. SCOPE:

- 2.1 This Indian Railway Standard covers :

- (a) Technical requirements for the supply of "MIXTURE" for full fusion method of welding of rails.
- (b) Acceptance tests for such welded rail joints at site.
- © Technical procedure for approval of "Contractors" and "Welding Supervisors".

- 2.2 The acceptance tests specified here are for fusion welding of flat bottom steel rails to IRS Specification T.12.UIC-860-0 alloy steel rails of Chrome-Manganese & Chroma-Vanadium types and any other type of rails that may considered for use on Indian Railways by alumina-thermic process.

PART-I TECHNICAL REQUIREMENT FOR THE SUPPLY OF "PORTION"

3. SUPPLY OF THE "PORTION" :

- 3.1 The "portion" shall be submitted for acceptance batch wise.
- 3.2 Every portion shall be packed in a moisture proof bag of polyethylene to IS:9738-81. Indian Standard Specification for "Polyethylene bags for general purpose" Gr.HM NDPE 150 initially and then finally in heavy duty. Bag made of cloth to IS:187-78, Indian Standard Specifications for "Cotton long cloth" and sealed in such a manner that no chance can be made to the "portion" without damaging the bag or breaking its seal. The following particulars shall be indicated on two similar tokens – one placed inside and the other of the outside with the seal of the bag:-
 - i) Batch No. Portion No.
 - ii) Date of manufacture.
 - ii) The section and type of rail to be welded.
 - iii) Process of welding i.e. conventional short pre-heating/SKV.
 - iv) Insignia of the firm.

The insignia of the firm shall also be printed on the bag in red for MM quality rails to I^rRST-12, in green for rails of 90Kg/MM min. UTS and in black for Alloy steel rails with 118 Kg/MM² min. UTS. The portion bags shall be packed in a sturdy wooden/metallic container with suitable portion in such a way that no bag rests on another bag and damage during transit is avoided. Any bag of portion found damaged during transit shall not be used for welding. No container with the portion bags shall weigh more than 60Kg.

4. TECHNICAL REQUIREMENT :

4.1 The following tests shall be conducted for assessing the quality of the “portion”.

(a) Reaction test.

(b) Mechanical test on test welds.

© Ultra Sonic test on test welds.

5. REACTION TESTS:

5.1 The Alumino – Thermic reaction shall be allowed to take place in a standard crucible similar to that used in site-welding. The Alumino-Thermic steel shall be founded in standard moulds so as to obtain bars having a diameter between 25 and 35mm.

5.2 During the course of the Alumino-Thermic reaction observations in regard to the characteristics of the reaction i.e. whether it is quiet normal, vigorous or boiling shall be made. The reaction shall not be vigorous or boiling. The duration of the reaction shall be 20.5 seconds.

5.3 The sample of Alumino-Thermic steel obtained from the above reaction, when fractured, shall not show a mirror like structure or accretions, The fractured surface shall show a fine grained crystalline structure.

5.4 A transverse section shall be cut from the middle third portion of the bar of Alumino- Thermic steel obtained from reaction test as laid down in Clause 5.1. Alumino content of the steel shall be determined section. The Aluminium contents so determined shall not be less than 0.25% and shall not exceed 0.7%.

6. NUMBER OF REACTION TEST :

6.1 Reaction test shall be carried out on one “portion” for every 25 “portion” or part thereof of a batch. In addition to above, the nature of reaction and reaction time of the test weld joint shall also be recorded.

7. TESTS ON TEST WELDS:

7.1 Test welds samples welds shall be made either on new rails or on old but unable rails of similar sections and conforming to the same rail specification. Two pieces of rail length not less than 750 mm required for the test weld shall be used. The rail pieces can be purchased from the Railway Administration.

7.2 Spattering- No spattering of the fused MIXTURE shall occur when it is run into the moulds.

7.3 Casting defects- The excess of weld metal above the rail table and sides shall be chipped off in red-hot condition and shall not show any brittleness (i.e. brittleness of metal under red hot condition). The weld surfaces after chipping, shall be ground to make the weld surface perfectly flat in line with the parent rail and shall not show any porosity or slag inclusions and other casting defects.

7.4 Ultrasonic test- The test weld joint shall be ultrasonically tested as per the “ Procedure for Ultrasonic testing of Thermic welded rail joints” given at Annexure- A, The joint on testing shall be sound as per stipulation .

- 7.5 Hardness test- Brinell Hardness test shall be carried out at the welded zone, heat affected zones and parent metal of the rails in accordance with IS: 1500 “Method for Brinell hardness that for steel”. The test shall be done on the top surface of the head of the test weld with a ball of 10 mm dia and a test load of 3000 Kg. maintained for 10 Sec. The average hardness number (of two readings) determined for the weld metal at locations shown as “A” in Fig. –1 given below shall be within + 20 HB of the hardness.

Or

Value of rails as shown in table-1 . The average hardness number (of two readings) on each heat affected zone at locations shown as “B” & “C” in Fig-! Shall be within +20 HB actual hardness of the parent rail, except in case of head hardened rail.

TABLE – 1

Type of rail	72 UTS Rail	90UTS Rail	UIC Gr-Mn or Gr.-V alloy steel Rail	Head hardned Rail.
Average Hardness (BHN)	230	265	310	365

7.6 Transverse breaking load test.

- 7.6.1 The test weld shall be supported on cylindrical or semi- cylindrical supports having a distance of one meter between them from centre to centre. The weld shall be at the centre of the span and loaded in such a manner that the foot of the rail is in tension. The diameter of mandrel and the supports shall bet between 30 to 50mm . The load shall be gradually increased (rate of loading shall not exceed 2.5 T/Sec.) till rupture occurs.

The test weld shall withstand a minimum load and show corresponding minimum deflection as stipulated in Table 2 for differ sections and types of rails.

TABLE – 2

Rail type	Rail section	Min. transverse breaking load	Min. detection at the centre at the load in Col. 3 (mm)
1	2	3	4
72 UTS to IRS – T- 12- 1996-	60 R	50	15
	75 R	60	15
	90 R	70	15
	52 Kg.	85	18
	60Kg.	95	18
90 UTS to IRS – T- 12- 1996/UIC 860 – O or equivalent Alloy steel (Cr. – Min or Cr. – V type) 110 UTS Head hardned rails.	75 R	65	15
	90 R	85	15
	52 Kg	90	15
	60 Kg	115	15
	52Kg.	95	10
	60kg.	115	10
	60 Kg	115	15

- 7.6.2 exceed 2mm If the fracture does not occur through weld , a slice shall be cut transversely at the weld and etched in boiling 1:1 hydrochloric acid for about 20 minutes to determine casting defects if any.
- 7.6.3 The fractured surface of the weld , or in case where macro-etching is done on transverse section through the joint shall show defects such as blow holes, porosity , inclusions etc. exceeding total permissible area of defect shown in table –3 . However , the size of any individual defect shall not diameter. The defects should not be interconnected and none of these shall extend up to the outer surface of the weld. There shall not be any lack of fusion. The fractured surface shall also not show the presence of accretions or mirror like structure and shall be crystalline in appearance

TABLE – 3

Area of permissible defects.	
Rail Section	Permissible total area of defect (mm ²)
60R	19.0
75R	23.7
90R	28.5
52 Kg.	33.0
60 Kg.	38.4

8. RETESTS:

- 8.1 If the results of any tests referred to in para 4.1 & 4.2 are found to be unsatisfactory, the batch will stand rejected. However , re tests can be carried out at the manufacturer's request. These re-tests shall be carried out as per para 4.1 & 4.2 on twice the original sample size.
- 8.2 If the results of all the retest samples are satisfactory , the batch represented by the sample portions shall be accepted. If any sample fails to meet the requirement of any of the tests, the batch shall be rejected.

9. Additional Test after reprocessing:

- 9.1 In the event of any sample 'Portion' from a batch failing to comply with the requirement of CT-5, the supplier, if he so desire may be permitted to resubmit the batch after necessary reprocessing once only. The reprocessed 'Portions' shall be submitted under a separate batch and serial numbers.

10. Acceptance:

- 10.1 Acceptance shall be done batch-wise . Every Individual batch that satisfies the conditions prescribed in the specification shall be accepted after an identification mark has been put on it by the inspecting officer.

11. TESTING FACILITIES:

- 11.1 The supplier shall, at his own expense supply all labour and appliances for such testing both for initial and retest as may be carried out in the presence of the purchaser or the Inspecting officer in his own premises or at any other place acceptable to the purchases in accordance with this specification.

12. INSPECTION

- 12.1 The purchaser and the Inspecting Officer shall have free access to the premises of the suppliers at all reasonable times. They shall be at liberty to inspect the records and the manufacture at any stage.

PART – B: ACCEPTANCE TEST OF FULL FUSION WELDED JOINT AT SITE

13. EXECUTION OF WELDING AT SITE

- 13.1 Alumino-thermic welding of rails by this process shall be executed at site under the supervision Of competent welding supervisor certified by RDSO (see part 'C').

14. GUARANTEE

- 14.1 Rail joints welded by a contractor shall be guaranteed by him against failure for a period of two years from the date of welding the joints in track or from the date such welded joints made in case are inserted in the track. Any such welded joint which fails within the guarantee period shall be re-welded free of cost by contractor.

15. ACCEPTANCE TEST.

- 15.1 One out of every 100 joints welded per batch shall be selected at random by the purchaser or by the inspecting officer and shall be picked up and subjected to hardness and transverse test as per clause 7.6. The joint shall comply with the provisions laid down therein.
- 15.1.1 In the view of any welded joint failing in any one or more requirements of this specification, the Railways will be at liberty to suspend for the further welding of joints. The work will remain suspended until the contractor has improved his welding technique and the joints welded by him meet the requirements of the tests, Further, the period of guarantee vide clause 15 above of the joint already welded shall be extended for a further period of one year and any such welded joint which fails within this extended period of guarantee or shown signs of failure by cracking shall be re-welded free of cost by the supplier.
- 15.1.2 The welded joints with the extended period of guarantee shall be marked 'X' on the outer side of the head of the rail near the joint in addition to the markings prescribed in clause 17. Such marked joints shall be kept under careful observation by the Railway.
- 15.1.3 All the fusion welded joints shall be ultrasonically tested by the purchaser (Railways representative) as per the "procedure for ultrasonic testing of Thermit welded rail joints" given in Annexure 'A'. This testing shall be completed as early as possible but before the contractor/welding team leaves the welding site. All the joints which are found to be defective, shall be cut and re-welded by the contractor /welding team free of cost. Such re-welded joints shall also be tested ultrasonically and if found defective cut and re-welded free of cost.
- 15.1.4 All the welded joints shall be checked to ensure that the joints geometry is within the following tolerances:
- i) Vertical Alignment: Variation not more than $\pm 0.5\text{mm}$ Measured with one metre straight edge.
 - ii) Lateral alignment: Variation not more than $\pm 0.5\text{ mm}$ measured with metre straight edge along gauge face.
 - iii) Head finishing on sides : $\pm 0.3\text{mm}$ over both side of the rail head measured over 10 cm.
 - iv) Finishing of top surface: $\pm 0.2\text{mm}$ measured over 10 cm.
- The details of the track joint geometry for each joint shall be jointly signed by the contractor and railway's representative and kept as a record . Any joint found not confirming to the above stipulations shall be cut and re-welded, free of cost, by the contractor

16. MARKING

- 16.1 All the joint shall be distinctly punched not less than 5mm size steel stamp by the contractor in the following manner:-
(Month, year, Firm's insignis, Serial No. of joint and 'X' (Where necessary)
- 16.2 The marking shall be on the outer side of the rail web within 150 mm from the welded joints.

PART 'C' APPROVAL OF 'CONTRACTOR' 'WELDING SUPERVISORS'

17. The approval of 'contractor' shall be given for manufacture of 'Portions' and execution of rail joints at site using their welding technique, for each type of rail section and rail chemistry separately. The approval of 'Welding Supervisor' shall be given for execution of rail joints at site, for each type of welding technique, rail chemistry and contractor wise.
18. For the purpose of approval the following definitions shall apply:-
 - 19.1 'Contractor' shall mean the organization manufacturing the 'Portions' and executing the welding of rail joints by alumino thermic process using their own technique.
 - 19.2 Welding Supervisor, shall mean an individual with adequate knowledge and competent for supervising and executing alumino thermic welding of rail joints at site using his own trained gang representing either a 'contractor' or a Zonal Railway or any other independent organization.
 - 19.3 'Approving Authority' shall mean Director General, Research Designs and Standards Organization, Ministry of Railways, Manak Nagar, Lucknow-226011 or his representative.

20. PROCEDURE

- 20.1 The application for approval shall be submitted by the contractor indicating the technique, rail section and rail chemistry intended to be welded and the welding supervisor indicating the approved contractor's name, technique and rail chemistry intended to be used for welding to the approving Authority. The letters shall be addressed to Director General (M & C), research Designs and Standard Organization, Manak Nagar, Lucknow- 226011.
- 20.2 The applicant shall deposit the amount as per clause 23.3 and return the proforma duly filled in giving the requisite information.
- 20.3 On scrutiny of the information, if the same is primarily found to be satisfactory, the approving authority shall inspect the premises of the applicant giving due notice for assessment of the facilities. On inspection of the premises, if the facilities are found to be satisfactory tests and trials shall be undertaken by the approving authority:-

21. TESTS AND TRIALS.

21.1 Approval of contractor

- 21.1.1 The contractor shall manufacture a batch of 150 'Portions' free of cost conforming to the requirement of part. 'A'. Samples shall be drawn at random by the approving authority and following laboratory tests shall be carried out at the contractors' work premises or at a laboratory mutually agreed upon between contractors and approving authority.
 - i) Six Nos. of reaction tests,
 - ii) Welding of twelve test weld joint.
 - iii) Ultrasonic testing of above joints as per Annexure 'A'
 - iv) Brinell Hardness test of the above joints.
 - v) Transverse (load-deflection) testing of six test weld joints.
 - vi) Magnetic crack detection test and macro-examination of across the weld to ensure freedom from harmful defects.
- 21.1.2 Subject to the results of the above tests being satisfactory as per stipulations given in PART – A. Service trial for a period of one year or till 10 GMT passes over the joints shall be undertaken on 100 rail joints welded using the same batch of 'Portion' as indicated in Cl. 21.1.1 against a trial order to be placed by the railways. During execution of trial welding at site, spoiled joints (due to self-tapping, luting leakage, reaction inside the mould), if any, shall be cut and re-welded by the contractor at his own expenses. Failure of joints during the period of service trial shall not be more than 2%.

- 21.1.3 All the 100 trial joints shall be ultrasonically tested as per the procedure given in Annexure 'A' Defective joints subject to a maximum of 5% shall be cut and re-welded free of cost . If more than 5% joints are found defective, the trial shall be discontinued considering the technique to be unsatisfactory.
- 21.2 Approval of welding supervisor:-
- 21.2.1 The welding supervisor desires for obtaining approval shall have to utilize his own welding team at his own works premises or any other place mutually agreed upon by the supervisor and approving authority using his implements 'Portions' of approved contractors sand etc. free execution of test weld joints following the approved technique for laboratory evaluation only.
- 21.2.2 Following tests shall be carried out confirming to requirement s at part 'A' at the welding supervisor's works premises or a laboratory mutually agreed upon by the welding supervisor and approving authority:-
- i) Welding of six test weld joints of different sections rail for a particular chemistry for which approval is sought.
 - ii) Ultrasonic testing of above joints as per Annexure – 'A'.
 - iii) Drinell hardness test of the above joints.
 - iv) Transverse (lead deflections) testing of three test weld joints, one each for each section.
 - v) Magnetic crack detection test and macro-examination of remaining three test weld joints longitudinally sectioned across the weld to ensure freedom from harmful defect.
- 21.2.3 On satisfactory completion of tests as per stipulations given in part 'A' , a competency certificate valid for two years shall be issued to the welding supervisor. No welding at site shall be permitted to be carried out without the supervision of an approved welding supervisor. Every approved welding supervisor's competency shall be reassessed by RDSO every two years based on the performance or by actual testing.
22. RETESTS
- 22.1 In the even of any test as described in clauses 21.1.1 and 21.2.2 fails to satisfy the test requirements, twice the member of the test specimen made for that test shall be prepared using 'portions' from the same batch and submitted to the tests in which failure occurred . the contractor/ welding supervisor shall not be approved unless all tests on additional specimens are satisfactory.
23. LEY OF CHARGES FOR APPROVAL
- 23.1 The contractor shall deposit the earnest money, and pay all the testing charges in advance as would be intimated by the approving authority vide clause 20.0.
- 23.2 The welding supervisor shall pay all the testing charges as would be intimated by the approving authority, vide clause 20.2.
- 23.3 The earnest money and testing charges as the case may be shall be permitted to the approving authority in advance through a Demand draft drawn in favour of Joint Director (Finance), Research Designs and Standards Organization , Manak Nagar, Lacknow-226011.
- 23.4 On approval of the contractor the earnest money deposit shall be returned by the approving authority, otherwise, the same shall be forfeited.
24. REMOVAL OF CONTRACTOR/WELDING SUPERVISOR FROM APPROVED TEST.
- 24.1 The approving authority will have the right to disapproved any approved contractor /welding supervisor based on complaints regarding his performance received from the Railway.

25. PART- d – ACCEPTANCE TEST OF JOINTS WELDED AT SITE ,
EXECUTION OF WELDING AT SITE.

25.1 Alumino-thermic welding of rails shall be executed at site only under the direct supervision of welding supervisor and by welder: Both having valid competency certificate issued by RDSO/TPP, Lucknow.

25.2 All alumino-thermic welding work shall be executed with the use of weld Trimmer and profile Grinder, Additionally , rail tensors shall be used wherever work is done on welded rails.

NOTE : In case of welding of old rails dispensations for not using weld trimmers and profile grinder shall be obtained from Chief Engineer.

25.3 ACCEPTANCE TESTS

25.4 JOINT GEOMETRY

All the finished welded joints shall be checked to ensure that the joint geometry is within the following tolerances :-

- | | | |
|------|------------------------------|---|
| i) | Vertical misalignments | $\pm 1.0\text{mm}$ (measured at the end of
- 0.00mm (1m Straight edge). |
| ii) | Lateral misalignment | $\pm 0.5\text{mm}$ (measured at the centre of
- (1M straight edge). |
| iii) | Head finishing on sides. | $\pm 0.3\text{ mm}$ on gauge side (measured at
- the centre of 10Cm straight edge. |
| iv) | Finishing top table surface. | $\pm 0.4\text{ mm}$ (measured at the end of 0mm 10 Cm
straight edge) |

NOTE : Dispensation for joint geometry , in case of old rail may be permitted by Chief Engineer The details of geometry of each joint shall be jointly signed by the firm's representative and kept as a record. Any joint found not confirming to the above stipulations shall be cut and re-welded , free of cost , by the firm.

25.5 ULTRASONIC TESTING

All the welded joint shall be ultrasonically tested by the Railways as per the procedure .

This testing shall be completed as early as possible after welding but before the welding team leaves the welding site. All the joints which are found to be defective shall be cut and re-welded by the firm using their portion, equipment, labour and consumables.

Where one bad joint is required to be replaced by two new joints, the entire cost of both the joints shall be borne by the firm. Such re-welded joints shall also be tested ultrasonically and if found defective, shall again be cut and re-welded free of cost.

ANNEXURE 'A'

PROCEDURE FOR ULTRASONIC TESTING OF THERMIT WELDED RAIL JOINT.

A.1 General Conditions:

- A.1.1 Surface preparation:- The flange up to a distance of 180 mm on either side of the weld collar shall be thoroughly cleaned with a wire brush so that the surface is free from dust, rust etc. in case of 80° probe testing.
- A.1.2 Couplant: Water shall be used as couplant
- A.1.3 Sensitivity: The sensitivity for testing with normal probe, 70° and 80° probe shall be adjusted as per instructions laid down at clause A.4. The sensitivity so adjusted to be considered as normal gain.

A.2 Apparatus required:

- A.2.1 Equipment SZ 62 rail testing trolley (krauthammer) with USK 4 ultrasonic flaw detector of FCIL or Vibronics Rail test or similar with their representative flaw detectors.
- A.2.2 Probe: Normal 4 MHZ and 70°, 2 MHZ probes fitted to the trolley and one 80° 1.25 MHZ probe for hand probing.
- A.2.3 Cable: A coaxial cable of suitable length for connection 80° probe to flaw detector.

A.3 TESTING PROCEDURE :

- A.3.1 Testing with Normal probe : The testing shall be done with normal gain settings. The height of the flaw signals, if any shall be noted.
- A.3.1.1 The welded joints showing a flaw echo equal to or more than the height at different depth stipulated below shall be considered as defective:-

Depth from rail table (in terms of horizontal divisions on screen) *	Height of flaw echo (in terms of vertical divisions on the screen)
1. Over 0 to 1.3	2.0
2. Over 1.3 to 1.6	1.5
3. Over 1.6 to 2.0	1.0
4. Over 2.0 to 3.0	0.5

- **NOTE :** The above stipulations are keeping in view the initial Perspex setting to be at 0. In case the initial setting is at 1.0 as is for K.K. machines, 1 shall be added to the horizontal divisions stipulated.
- A.3.2 Testing with 70° probe. In case of lack of fusion and blow holes in the head, moving signals may be obtained while testing with 70° probe. The position of the on set of signals and the range of movement in the screen and their maximum height shall be recorded.
- A.3.2.1 Any welded joint showing a moving flaw signal of 0.5 vertical height and above, obtained with normal setting, shall be considered as defective.
- A.3.3 Testing the flaws in the flange with 80° angle probe. To detect the flaws in the flange portion, the testing shall be done manually, The flaw detector shall be removed from the trolley and kept on a suitable place nearby. The 80° angle probe shall be connected to the transmitted socket by the coaxial cable as 80° angle probe is a single crystal type working both as transmitter and as receiver. Couplant shall be applied in both sides of the weld collar on the flange of the rail. The probe shall be kept on the flange at a suitable distance corresponding to position of Fig. A (i.e. at 170mm for 90R section or below ** considering the average thickness of the flange for different rails sections) so that the ultrasonic waves are directed towards weld, The probe shall be slowly moved with a zig-zag motion towards the weld. Any moving signal observed shall be recorded. Testing of all the other locations C & W shown in fig. A shall be similar carried out.

** for lower section of rails or above for higher section rails

- 3.3.1 Any welded joints when tested with normal gain setting showing any moving flaw signal shall be considered as defective.

A.4 INSTRUCTIONS FOR CHECKING THE FUNCTION AND SENSITIVITY OF THE SYSTEM

A.4.1 Test Rails : The checking of the sensitivity and setting of the system shall be carried on a sound test rail sample with weld joint at the middle. The rail piece shall be 1500mm long. A 5mm dia hole shall be drilled through the weld metal at about 750mm from either end. The axis of the hole shall be at 90° to the longitudinal axis of the rail and parallel with and 25mm below the rail tread. A 3mm dia hole shall also be drilled at vertically at the middle of the flange through the weld-about 750mm from either end of the rail or a 2mm deep transverse saw cut shall be made on the bottom of the flange across the weld.

A.4.2 : ALIGNMENT OF PROBES :

A.4.2.1 The alignment of normal and 70° probes fitted with the rail tester shall be checked by placing the rail tester on the test rail using water as a couplant ensuring that the probes travel in line with the axis of the rail head and web.

A.4.3. The angle probe, bearing in the direction of travel shall be switched on. The equipment shall be moved towards the drilled hole and when the probe is just in the front of the hole a pulse should appear on the screen, which during the onward travel should move from right to left, in the transmission pulse. The equipment shall be again moved forward. When the main portion of the beam is directed on the hole the pulse will attain the maximum after this it will be reduced suitably the gain shall be adjusted to get the max.flaw indication up to div . height. The forward probe shall be switched off and the other creeping to the rear, that is in opposite direction to the of travel shall be switched on. The equipment shall be again moved forward. In the screen that is from left to right, The shape and the height of the pulse should be about the same for both probes. Should one probe be more sensitive than the other, relevant potentiometers shall be adjusted to give a uniform height of the signal.

A.4.4 CHECKING THE FUNCTION AND SENSITIVITY OF NORMAL PROBE

The normal probe shall be switched on after placing the same at un-welded location of the rails and the bottom signal from the foot of the rail adjusted to the full screen height. After ensuring the receipt of bottom signal, the trolley shall be moved for positioning the normal probe just above the 5mm dia hole of the test rail. The gain shall be so adjusted to obtain a maximum flaw peak from this hole to 3.0 division height at 0.5 division horizontal scale with the test range at 250mm.

A.4.5 On adjustment of the sensitivity of the normal probe, the shear wave indications from the 70° probe shall be re-checked switching on all the three probes. The angle probe signal reflected from the hole shall have a maximum height of at least 2 division.

A.4.6 Normal gain setting of the ultrasonic flaw detector during testing with 80° probe shall be such that a two division vertical height peak is obtained from 3mm dia hole at the flange across the welder 2mm deep transverse saw-cut.

Special condition of track

1. The work will be done as per instruction and under supervision of sectional PWI or his representative
2. Day to Day caution will be issued by sectional PWI or his representative and track protection will be done by Railway.
3. The work will normally be done for 6 days in a week.
4. All tools and plants including rail cutting machine , hacksaw blades and drill twise, ratched brace etc. required for the work will be supplied by the contractor at his own cost.
5. Traffic block required for the work will be arranged by the sectional PWI or his representative and contractor will be responsible for strict adherence and timely completion of work. In case of non-availability of block due to any reason no compensation will be payable.
6. The work will be carried out in day time between sun rise to sun set only and the contractor must ensure that during the course of work as well as after the days work track is fit for movement of traffic.
7. No compensation towards any accident what so ever will be paid by the Railway.
8. Packing will conform to para 224 , item (1) & (2) of Indian Railway P.Way Manual.
9. The work may be started from the length of the section according to the need of the Railway and as directed by PWI In-charge. The contractor shall be bound to execute the work accordingly.
10. Medical facilities, housing and watering arrangement for contractor's labour and his staff will be arranged by the contractor.
11. The track will be handed over in perfect condition i.e. level gauge's alignment, packing and boxing should be proper before the work ends finally.
12. The work will be done under speed restrictions to be imposed by sectional PWI. Caution signalman will be provided by the Railway.
13. Contractor will use 20mm size screening mesh for screening work.
14. Wooden blocks and wedges required for the work will be supplied by the contractor at his own cost.
15. No two consecutive sleepers shall be tackled at a time.
16. Work will be stopped in perfectly safe condition at east 06 minutes earlier before passenger of every train.
17. The length of the track will be taken open or different operations of Deep screening etc. as per the direction of the Engineer at site.
18. Deep screening must proceeds changing of sleepers, Deep screening and re-sleepering shall not be done simultaneously at a particular location.
19. Prevention of accidents, where vehicles are permitted to ply adjacent to the running line experienced Gangman shall also be posted by the Railway as Flagman at the cost of the contractor to prevent accidents and the amount towards wages of the Flagman will be recovered from the contractor's bill.
20. If there is any conflict between conditions nominated in the "special condition" contained herein and which appear in the pamphlet and schedules reformed in the former shall be observed.
21. Any further clause or remarks added in the tender form by the contractor will disqualify his tender. In case of any remarks required to be added that should be done in a covering letter.
22. No enhancement over the accepted rates will be allowed in any case of any subsequent enhancement of Railway freight, Govt. Duty Taxes of any sort, levey of new taxes rise in wages and prices of materials etc.. The points should be taken into account while quoting rates.
23. The contractor must abide by and comply with the provisions and Rules of contract Labour (Regulations and Abolition) Act. 1970 and Central Rules- 1971.
24. The contractor shall be responsible for adequate supervision of the work as regard safety of track , train and travelling public, proper care and custody of Railway Materials and any other Govt. property handed over to be the concerning PWI till it is returned back to PWI concerned at his/their stores and properly stacked at place indicated by PWI concerned. In the event of loss of any materials, the cost thereof shall be recovered from the contractor at issue rates plus the present codal charge of 20.5% to this will be added an increase of 100%.
25. Deep Screening/Track Renewal works shall be allowed to be taken up by the contractor only after issue of "Permit to work" by a competent Railway Supervisor daily whenever work is in progress.
26. Adequate numbers of labourer are to be provided in the work by the contractor, during execution.