RAIL THERMITE WELDING NEW GENERATION WELDING



Manufacturer

Thermite Weld (Pakistan) EST.

Office: Room No. 1, 3rd Floor Raja Chamber, 35-Queens Road, Lahore.

Factory: Shadiwal, Moterway, Thokar Niaz Baig, Lahore

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www.thermiteweld.com

thermiteweld

Introduction

Railroad Thermit welding is one of the major techniques currently applied to the continuous rail welding in all countries, with such advantage as simple in Eqipment, low in cost, and quick operation and the advantage of not requiring High power Source.

Rail Thermite Process

Railroad Thermit Welding Process Uses a alumino – thermic reaction of a mixture containing fine aluminum powder and iron oxide for producing the Molten steel (hot liquid alloy) and slag. The hot liquid steel of defined quality pour into the mould fixed around the rail ends. The alumino –thermic reaction produces metals in an exothermic reaction, may be described as follows:

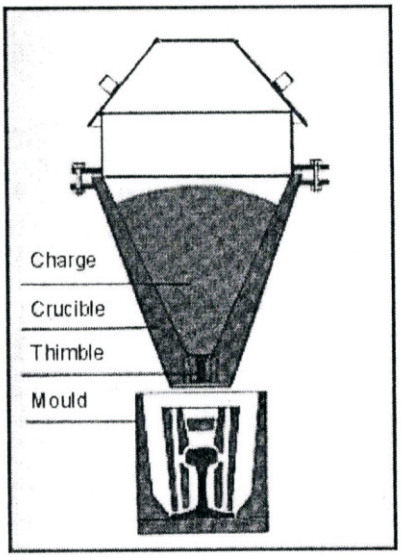
Heavy metal oxide + aluminum →

Heavy Metals +Aluminum oxide + heat.

$Fe_2O_3 + 2Al = 2Fe + AL_2Q_3 + 181.5$ K cal.

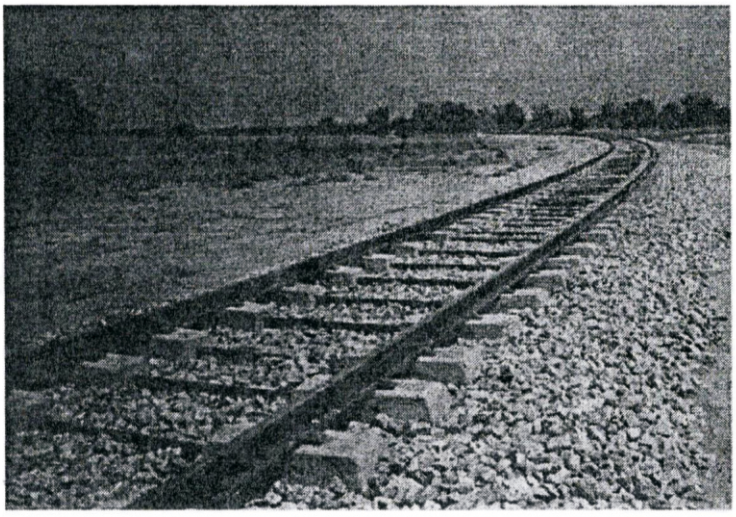
This reaction, discovered in 1896 by

Prof. Dr. Hans Gold- Schmidt of Germany.



On reaction the ignition of the Thermit mixture In crucible generate strong heat between 2300 Degree C to 2700 C degree

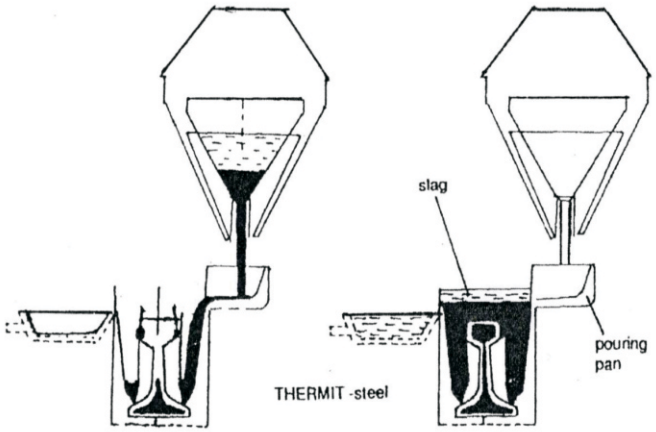
With the advantage of simple Equipment, low investment, And quick Operation, and the Feature of not requiring High Power Supply and involving Only Simple Treatment of The surface of the rail to be Welded and simple welding Operation, Thermit Welding Provides Adaptability for Site Welding, welding Just after 15 minutes and in Emergency. Therefore,the Thermit welding Process Wins extensive Used In railway Industry.



View of Main Track Section of PWI / Okara Between Sahiwal – Yousafwala, Lahore Division where ½ K.M. both sides Rail Joint Welded with Pakistani Themit – 2002.

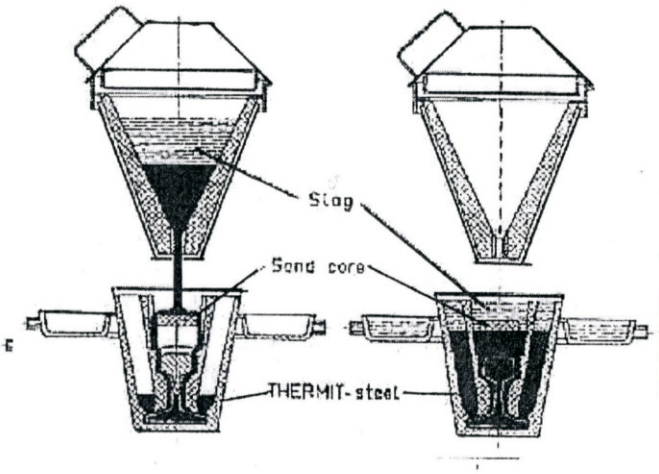
With standard
Preheating

Smw-F system



With short
Preheating

Skv.system



SAFETY FIRST

Always use gloves, goggles, leggings and safety shoes while working on Track.



1: - PREPARATON OF JIONT TO BE WELDED

- 0 Loose three sleepers on both side of the joint.
- 0 Loose six sleepers incase of curve
- 0 Ends of the rail to be cleaned with brush
- 0 To remove scale grease/ oxidation etc.
- 0 Use disk rail saw for cutting rail.
- 0 Use iron plug for cutting defective rail.



2: - ALIGMENT OF JOINT

- 0 Align rail joint with 1 mt straight edge.
- 0 Check two rails inside surface of the railhead.
- 0 Check two rail feet are not tieted.
- 0 Super elevation of two rails should be 2 mm.

3: - WELDING GAP

- 0 Welding gap for 90/100 lbs, UIC 54 should be 20 mm ± 2 mm
- 0 Gap should be measured with measuring wedge.
- 0 2 equal cutting have to be made for enlargement adjustment the gap on Both side of the rail end.

4: - FIXING OF MOULD

- 0 Under the rail joint, put the send pan between the two sleepers.
- 0 Place the universal clamping assembly on the rail relation to the gap axis.
- 0 Set the moulds on the both side of rail end to be welded, centrally to the gap.
- 0 Tight the screw of clamp assembly both side.
- 0 Pressure on both sides of the mould have to same .
- 0 Fill bottom & side all around the per meter of the mould gap with wet mixture of Silica sand and betonies @ ratio 1:4
- 0 Place pouring cup with pouring steel cup and fill the space between the cup outlet With mixture.
- 0 Attach the slag tray & seal with mixture as before.

5: - **SETTING OF CRUCIBLE**

- 0 Clean crucible from slag.
- 0 Preheat the crucible with burner approximately 5 minutes or 80 C 176 F.
- 0 Place the crucible in steel body frame with steel head.
- 0 The space between the bottom of the crucible and cup should be 30 to 40 mm.
- 0 Put the tapping rod into the bottom and filled with mixture of asbestos and magnesium oxide. The aim of this operation is to protect the base of crucible from Auto flow / charge.
- 0 Or place an automatic thimble in the bottom of crucible. This thimble should be Used only once in a time.
- 0 After the end of casting it should be removed from crucible.

6: - **CASTING OF CRUCIBLE**

- 0 Fill the Railroad welding powder into crucible slowly.
- 0 Press a little deepening into the middle of crucible .
- 0 Ignite the igniter with match and put it in the middle of the portion.
- 0 Put the crucible cap on crucible.
- 0 In a few seconds reaction will be done and pouring will be automatically take Place. Excess slag will be automatically poured into the tray.
- 0 Now remove the crucible.
- 0 Remove the slay tray. Never throw slag on a wet or frozen place nor on a sleeper.

7: - **PREHEATING AIR PETROL**

- 0 Rail end or preheated by propane / oxygen mixture.
- 0 Temperature of the rail ends should be 900 C –1000 C (1750-1850 F)
- 0 Color: yellow –red to yellow.
- 0 Railhead, web and foot should be heated equally in temperature.
- 0 The time for preheating depends upon the rail profile and type of fuel mixture Used are as under.

Rail Section	oxygen propane	oxygen petrol	compress air-petrol
90/100R	8	6	8
52KG/m	7	7	10
60KG/m	8	8	12

Pre-heating time in minute

- The distance between the rail tap and burner should be 80 mm.
- On completing the preheating.
- (a) Close petrol cocks (b) remove the burner (c) Swung the crucible over the Pouring cup.

8: - REMOVAL OF EXESS MATERIAL

- Wait 3 minutes after pouring.
- Unfold after 4-5 minutes do not remove the mould if the thermit steel has Not yet set.
- Remove the excess material on the tap and sides of the rail by hot chisel and hammer. This operation must be carried out quickly after the shearing otherwise & too cold metal would make this operation most difficult.
- The riser is removed when the joint has cooled down to ambient temperature.

9: - GRINDING & FINISHING WELDING

- Grind the running surface and sides force with the rail profile-grinding machine.
- 0.5 mm thickness excess metal should remain on the top of the rail as well as an Side faces.
- Finishing grinding should be carried out with rail finish grinder.
- Remove all burner, sand and riser with the help of finish grinder.

10: - APPLICATION OF THERMIT

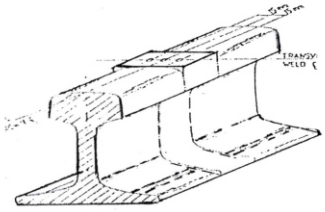
- All common rail qualities.
- Crossing and turnouts in track
- For welding in rail closures.
- Supported and suspended joints.
- not suitable for head herded rails.



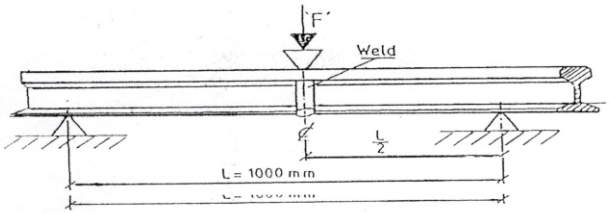
Testing

Railroad Thermit Welding can be tested by applying the following prescribed method.

(1) **Harness Test:** Brinell hardness should be checked at 3point with 10 mm dia Standard ball and withload of 30,000 kg for 15 seconds. Welding metal shall be
250 +_20 HBN after cooling to Rail temperature for Rail 90/100 Lbs.
300 +_20 HBN after cooling to Rail temperature for Rail Uci 54.



(2) **Bend Test:** slow bend test should be carried out with 2 supports of more them 1 mt. Maximum loads 1 mm / s should be applied as shown in the following figure.





Supply Order

On the bases of successful Reports of 5 welded joints.
In 8th May 2002 first trial order No: - 15/0004/01-0/-2001 (ADP) has been
Awarded to M/s Waheed Naeem & Company –Lahore a local manufacturer of Thermit
Welding Company (a subsidiary company of M/s Thermit Weld (Pakistan) Estd.
For the supply of

Railroad Thermit Weld Portions **80 Nos.**
Suitable for welding of 90/ 100 Lbs.
Rail having weight 6900 to 7000 Gr.

Trial Purchase Order.

Waheed Naeem & Co,
19-F,Raja Chauber,
25-Queen Road,Lahore.

Sheet to Purchase Order No.15/0004/01-0/1-2001(ADP). Dated 8.05.2002. With Messrs.

Sr. No. & Date	Description of Stores.	Quantity Ordered.	Unit	Rate Rs.	Value Rs.	Cost Centre	Material Acct.	Allied Code.
601,Spl:	Railroad Thermit Portions Suitable for Welding of 90/100 Lbs. Rail having Weight 6900 to 7000 Grams each duely packed in Sealed plastic and cloth bags with Ignitor. According to the requirement of Pakistan Railways. Note:- Purchase Order on Trial Basis.	80 Nos	EA	979.00	78320.00	0865	ASKW/ Welding/ RND	0877019

Quotation accepted by C.K.
FR-1/ADP/2001-2002 dated 14.4.2002.
Total Value Rs.78320.00
This covers CCS P.Reqn:No.MS:5/13/MS/1-2000 dated 10.01.2001+80 Nos out of 15000 Nos.

Sale Tax.Registration No.01-93-999-588-37.

Date of Delivery:-15.06.2002 or earlier.

Note:-1.The above rate/rates is/are overall and inclusive of the all Govt:Taxes & Duties and is/are firm and final. It is not subject to any variation whatsoever. It is further advised that even if there is any Increase/ Decrease in Govt:Taxes/Duties,No Increase/Decrease in rate shall be permissible.

2. The above rate/rates is/are also inclusive of packing and delivery charges.

3. The firm while submitting the bill must show their N.T.No.on the face of each bill.

4. The payment of bills may only be made to Suppliers/Contractors by Accounts Department on the production of proof that the professional Tax has been paid to Excise and Taxation Department.

5. In case of goods against this Tender Enquiry/Purchase Order shall be subjected to the production of proof of payment of duty and taxes,by the seller. No payment shall be permissible unless and until the said proof is provided.

6. Payment shall be made on presentation of sale tax registration No. as well as proof or payment of sale tax to the sale tax department.

7. Security deposit not given in the list attached.

M. Masood

Field Performance Report

August 2002 first Pakistani Thermit was used on main track in the section of PWI / kara between Sahiwal –Yousafwala, Lahore Division for ½ K.M both side jointed Rail 00 lbs. Their field performance / test reports was found satisfactory to date as shown om statement.

Statement showing No of, Joints welding with Pakistani Thermit
In the section PWI / Okara-between Sahiwal –Yousafwala, Lahore Division,
23.07.2002 To 08. 08. 2002

Date	Kilometers From	Kilometers To	No of Joint welded	Remarks.
23.7.2002	1061/5-7	1061/5.7	6	
24.7.2002	1061/6-8	1061/6-8	10	
25.7.2002	1061/7-9	1061/7-9	10	
26.7.2002	1061/9-10	1061/9-10	8	
27.7.2002	1061/9-11	1061/9-11	10	
28.7.2002	1061/10-12	1061/10-12	10	
29.7.2002	1061/11-13	1061/11-13	10	
30.7.2002	1061/12-14	1061/12-14	10	
07.8.2002	1061/8-9	1061/8-9	2	
07.8.2002	1061/11-12	1061/11-12	2	
08.8.2002	1061/14-15	1061/1-15	2	

Total ---------- 80 joint

Forwarded to STD/Welding for further disposal please .Up to date performance of the Thermit is satisfactory.

Rana Khalil –u-Rehm(A.FO/W)

Performance of Thermit received from M/s Waheed Naeem & Co.,Lahore has been utilized as per location mentioned above. Performance of the Thermite till date is Satisfactory.

Javid Iqbal (STD/W)

Detail of Joints Welded with the Thermit P.O.No: - 15/0004/01-0/1-2001 (ADP) dated 03.04.2003 their Performance to date is satisfactory.

NO: 55/W/81/Track –2002 Dt.26.08.2002

(SyedGhazanfar Abbas)
Executive Engineer /Track

Telephone Office : 539207
Grams : UNIVENGTECH

DEPARTMENT OF METALLURGICAL ENGINEERING
& MATERIALS SCIENCE
UNIVERSITY OF ENGINEERING & TECHNOLOGY
LAHORE - 54890, PAKISTAN.

No. Univ|Met-Engg.| 29
Date 15-1-02

HARDNESS TEST REPORT

Sample No. 1
BHN = 248

Sample No. 2
BHN = 255

Sample No. 3
BHN = 255

Sample No. 4
BHN = 241

Note: The above hardness values are each an average of 4 readings.

(Prof. Dr. Faizul Hasan) 15/1/02
Chairman

Reference: No. 555-W/81/Track/pt-IV dated 08.01.2002
Pakistan Railways.



GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE & TECHNOLOGY

PAKISTAN STANDARDS AND QUALITY CONTROL AUTHORITY
(TECHNICAL SERVICES CENTRE)
(FORMER MIRDC)

Job No.17151 **Dated** 03 MAY 20

HARDNESS TESTING OF THERMITE WELD RAIL LINE

Introduction:

M/s. Thermite Weld(Pakistan) Estd. 19-Raja Chamber, 35-Queens Road, Lahore, submitted a Thermite Weld Rail Line piece for Hardness Testing. Therefore the given sample was tested on the Rockwell Hardness Testing Machine by applying 150 kgs load with diamond cone at HRC scale. The results are tabulated below.

Results of Hardness Testing:

S.No.	Hardness	Scale	Conversion to BHN
1.	24.5	HRC	252 BHN
2.	24.5	"	252 "
3.	25.0	"	255 "

Note: The above mentioned hardness testing results pertains to the sample provided to Technical Services Centre, PSQCA only.

DEPUTY CHIEF ENGINEER
METALLURGICAL ENGG DIV.

SENIOR ENGINEER
DOCUMENTATION DIVISION

125-A Industrial Area, Kot Lakhpat, Lahore-54770 Pakistan
Tel: 5118022,5111804, 5150739 Fax No.(042)5122829



Performance of Joints 2002-2018

PAKISTAN RAILWAYS
HEADQUARTERS OFFICE, LAHORE

OFFICE OF DEPUTY CHIEF ENGINEER (TRACK)

No.555-W/81/Track/2002 Dated: -8-2004

TO WHOM IT MAY CONCERN

Sub:- PERFORMACNE REPORT OF THERMIT FOR WELDING.

Eighty Bags of thermit portion, manufactured by M/s Waheed Naseem & Co. Lahore were procured by Pakistan Railways for utilization on Trial basis vide Purchase Order No.15/004/01-1/1-200(ADP) dated 8-5-2002.

These thermit portions were used on the Track of Pakistan railways Main Corridors for the welding of 100 RE Rails at KM 1061/11-12 to KM 1061/12-13 on SAHIWAL-YOUSAF WALA section. These welds were provided during the period between 23-7-2002 to 8-8-2002.

These welds were used by Pakistan Railways after getting the necessary satisfactory certification and tests reports from the nominated Laboratories to the effect that the Thermit was in accordance with the standard specifications. The performance of the thermit portion from 8-8-2002 to this date of issuance of this certificate (15-8-2004) is satisfactory.

This certificate has been issued on the specific report of the supplier, made vide his letter dated 28-6-2004

Deputy Chief Engineer/Track
P.R, Headquarters Office
LAHORE.

PAKISTAN RAILWAY

No...W-T/132-RND-08/...M.S...I./Track Dated 17. 05. 2008

Chief Engineer (Track) Pakistan Railway,
H.Q. Lahore

SUBJECT:- PERFORMANCE REPORT
FOR THERMITEWELDING JOINTS.
P.O.NO: 15/0004/ 01-0/1-2001(ADP) dated 08.05.2002

It has been reported by the AEN/Raiwind & PWI /Okara vide their letter No.W-1/Track/Welding/Raiwind dated 02.05.2008(Copy enclosed). They have Ckacked the site at KM1061/11-12 to KM 1061/12- 13 on Sahiwal-Yousafwala section Of welding track. The Thermite Portion manufactured by M/s Waheed Naeem and Company, Lahore was produced by Pakistan Railway for utilization on trial bases Vide Purchase Order No: 15/0004 / 01-0/ 1-2001 (ADP) dated 08.05.2002 which Utilized on the above mentioned 100 RE Welded Track and found satisfactory.

The Performance of the Thermite Portion from 08.08.2002 to 02-05-2008 is satisfactory.

Divisional Engineer No.111,
Pakistan Railway- Lahore 19/5/08

DA/ Enclosed

Pakistan Railways.

From;PWI/OKR To AEN/RND

No;W/14 Dated;11-06-2018

Subject;Request for perfeamance of therni welding portion - installed in the section of PWI/OKR.

Reference;Your effice letter No;W/1-Misc dated 26-05-2018

In compliance to XEN/Track Pakistan Railways Head quarters effice Lahore letter No;555-W/81 /Track(Pt-1) dated 28-05-2018,it is submitted that - all over the performance of thermit portion duly manufactured by M/S Waheed Naeem & Company is satisfactory how ever the following three joins out of 80 Nos welded joints had been fractured during last 10 years - since 2008 to 2018,detail of fractured joints is given below.

1 Km 1061/9-10 RH fractured on 15-01-2008.
2 Km 1061/10-11 LH fractured on 27-12-2012.
3 Km 1061/11-12 RH fractured on 05-10-1013.

Assistant Executive Engineer
Pakistan Railway Raiwind
CC#: 4883

Permanent-Way Inspector
P.Rly: Okara .CCNo 4885

