PRESENTATION
FOR
EXOTHERMIC WELDING
BY
AVEC
SIGNALLING APPLICATION
This is to certify that the company

M/s Arun Verma Engineer & Contractors ( AVEC)

With Registered office at : E-137 , IIIrd Floor , Amar Colony , Lajpat Nagar - IV , New Delhi - 110024 , India

Is an Exclusive authorized Distributor for the geographic region of India of equipment / materials manufactured / supplied and sourced by M/s.
Korea EMI Technologies Co. Ltd. of 632-5 Jangam-ri , Majang-myeon, Icheon-si , Gyeonggi-do , 467-811 , Korea.

The equipment / materials in question are as follows :

Exothermic weld metal different sizes, Brand - EXOWELD
Graphite molds different size, Brand - EXOWELD
Flint Igniters - Sourced from Turner & Seymour Mfg. Co., USA or similar

In addition, M/s Korea EMI Technologies Co. Ltd. declare that we provide M/s Arun Verma Engineer & Contractors , (AVEC India ) with our full technical and logistical support.

This appointment will be effective from the date hereof for a period of three years and the appointment period will be renewed automatically unless one party send the written termination letter to the other party.

For and on behalf of
Korea EMI Technologies Co. Ltd

2013, Jan. 20

[Signature]

Korea EMI Technologies Co Ltd
632-5 Jangam-ri, Majang-myeon, Icheon-City
Kyeong Gi-do, Korea
TEL: +82-31-239-1918
Ref: STS/E/Exothermic Weld

18th July 2005

M/s. Arun Verma Engineers & Contractors,
22/140, Vikram Vihar,
Lajpat Nagar-IV
New Delhi-110 024

Sub: Recommended list for welding material for track circuit applications as per Specification No. IRS:S 103/2004.

Ref: 1. Your letter No. Nil dt. 7.6.05.
    2. M/s. LPI’s letter No. Nil dt. 21.6.05.

***

In reference to above, based on the documents submitted for ‘EXOWELD’ products, name of your firm has been included in the RDSO’s recommended list for supply of ‘EXOWELD’ exothermic weld material for track circuit applications to Indian Railways as per specification no. IRS:S 103/2004.

It may be noted that inclusion of name of your firm in the recommended list shall be valid for two years from the date of issue of this letter. Any renewal shall be considered based on the field performance reports. No RDSO’s inspection of the items covered by above referred specification is proposed for regular supplies of material to Railways.

This issues with the approval of competent authority.

( M. Mehrotra )
Director/Signal
for Director General/Signal
Ref: STS/E/Exothermic Weld

M/s. Arun Verma Engineers & Contractors,
22/140, Vikram Vihar,
Lajpat Nagar-IV
New Delhi-110 024

Sub: Recommended list for welding material for track circuit applications as per Specification No. IRS:S 103/2004.

विषय: ट्रैक सर्किट एप्प्रोच के लिए विद्युत शीटलिंग की रिकमेंडेड लिस्ट (स्पेसिफिकेशन सब आई.आर.एसएस 103/2004)।

2. This office letter No. STS/E/Exothermic Weld dt. 18.7.05.

संदर्भ: 1. आपके पत्र No. AVEC/EXOTHERMIC/COMM/031 दिन 13.6.07.
2. इस कार्यालय का पत्र No. STS/E/Exothermic Weld दिन 18.7.05.

***

Based on the documents submitted for ‘EXOWELD’ products, name of your firm was included in the RDSO’s recommended list for supply of ‘EXOWELD’ exothermic welding material for track circuit applications to Indian Railways as per specification No. IRS:S 103/2004 for the period of two years i.e. up to 18.07.07 vide this office letter under reference 2 above.

In reference to your letter (at Ref. 1 above), it may be noted that validity of name of your firm in the RDSO’s recommended list for supply of ‘EXOWELD’ exothermic welding material for track circuit applications as per Specification No. IRS:S 103/2004 is extended for two years i.e. up to 31.07.2009. Any renewal shall be considered based on the field performance reports. No RDSO’s inspection of the items covered by above referred specification is proposed for regular supplies of material to Railways.

This issue with the approval of competent authority.

( M.Mehrotra )
Director/Signal
for Director General/Signal
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2006/Sig/W/5 (T.C.)

New Delhi, dated 16.2.2006

The GM(S&T),
All Zonal Railways.

The Director General
RDSO, Lucknow

Sub: Improper installation of Exothermic Bond by unskilled staff.

RDSO vide letter no. SPS/E/Exothermic Weld dated 26.12.2005 has circulated "Recommended list for welding material for track circuit application as per specification no. IRS: 103/2004". Vide this, there are six RDSO recommended firm for supplying of Exothermic Weld/Pin Brazing method for track circuiting applications to make reliable and permanent electrical bond connection between two conductors.

Some Railways have reported that some times installation of Exothermic Bond is not being carried out by the authorized representative of RDSO recommended firm. This is resulting into premature deterioration of the connection between the conductors.

In view of the above it is decided that as far as possible following instructions may please be adhered to:-

• In all works where tender is being invited primarily for supplying and installation of Exothermic Weld/Pin Brazing method for track circuiting application to make reliable and permanent electrical bond connection between two conductors, only RDSO recommended firms or the firms who had engaged technicians having valid competency certificate issued by the RDSO recommended firms are allowed to participate in the tender.

• In composite work, successful tenderer should purchase the material from RDSO recommended source and the installation should also be got done by RDSO recommended firm or by the technicians having valid competency certificate issued by the RDSO recommended firms.

• The material for “Exothermic Weld/Pin Brazing method for track circuiting application to make reliable and permanent electrical bond connection between two conductors” can also be procured through stores and the installation can be done by Railways trained staff, who have been given competency certificate by the RDSO recommended firms.

RDSO should ensure that recommended firms impart training to technicians and issue competency certificate.

(P.K. Gupta)
Director (Signal)
The GM(S&T),
All Zonal Railways.

Sub: Recommendations of task force to study the issues concerning asset failure and asset maintenance for establishing of a near “Zero defect regime”.

Ministry of Railways (Railway Board) had constituted a multidisciplinary task force to study the entire gamut of issues concerning asset failure and asset maintenance and make recommendations for establishing of a near “Zero defect regime”. The terms of reference assigned to the task force to conduct the above study are as under:-

(i) To study the entire gamut of issues concerning asset failures, maintenance and make recommendations for establishment of near “zero defect regime”.

(ii) To make inter-alia inter-zonal and inter-country comparisons of asset failure and maintenance norms, procurement procedures and stores management and reporting, monitoring, decentralization and accountability norms.

Task force had submitted the report and recommendation to Board. Board has desired that the recommendations of the multidisciplinary task force should be communicated to the Railways. Accordingly the recommendations of the task force pertaining to Signalling and Telecommunication are as given below for implementation:

<table>
<thead>
<tr>
<th>Reco. No.</th>
<th>Recommendation</th>
<th>Remarks of Signal directorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>Asset failures and maintenance norms</td>
<td></td>
</tr>
<tr>
<td>8.1.1</td>
<td>Asset maintenance through AMCs as a general policy need to be discouraged and it should be resorted to only under the following situations.</td>
<td>Railways to note these recommendations for compliance. Railways have been advised vide letter no. 2005/SIG/SEM/8 dt. 4.10.2005 for entering into AMC for repairs of electronic modules/cards.</td>
</tr>
<tr>
<td></td>
<td>(a) Where there is no in-house expertise readily available to maintain new technology assets, AMC can be considered. Procurement contracts in such cases should have an inbuilt AMC clause so as to ensure maintenance for a period of 2-3 years by the supplier of the equipment beyond the warranty period. During this AMC period, expertise for in-house maintenance should be created by rigorous and appropriate training of staff and creation of necessary infrastructure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Where it is considered uneconomical to maintain assets in remote areas departmentally, AMC can be considered.</td>
<td></td>
</tr>
</tbody>
</table>
8.1.5 Since technology in all spheres of railway working is changing fast, often the existing skilled manpower is unable to maintain the new technology assets. This problem is further compounded by the existence of large number of vacancies against direct recruitment quota both under skilled artisan category as well supervisory category. RRB should be asked to fill up the existing vacancies in the next six months. Besides, a flexible system whereby qualified manpower can be inducted from the open market at the shortest possible time should also be devised. To combat the problem of maintenance of fast changing technology with no matching manpower to maintain them, a system of recruitment on temporary basis similar to what is being followed in the armed services (Short Service Commission) can also be tried. This will facilitate intake of qualified manpower at periodical intervals.

Yardsticks for Signal and Telecom staff has been issued vide Railway Board’s letter no. 94/E&R/1700/9(Pt.) dt. 27.4.2005 and letter No. 2000/Tele/MW/7/RCIL/A/pt. Dtd. 6.9.04. Staff should be sanctioned as per the yardstick.

The yardstick for Gazetted cadre is under consideration of the Board.

Railways should closely monitor filling up of Direct Recruitment(DR) quota of vacancies through RRB’s.

8.1.7 Miscreant activities as the cause for asset failure should not be accepted on a routine manner unless and otherwise it is established without any doubt through a proper investigation. In all such cases an FIR should be lodged with RPF and the RPF inspector should thoroughly investigate and give a report.

Northern railway has issued instructions for “Train logging for Law & Order” vide letter no. 51/SIB/Punctuality/2001 dt. 14.3.2001 (Copy enclosed). Whenever failures due to miscreant activities take place, the matter should be reported to RPF through control. RPF will in turn handover the memos to concerned GRP for proper registration of the cases. If RPF staff is headquartered at the station, S&T staff shall issue memo to RPF if available at station.

Specific anti-theft and anti-interference measures like providing cages, perforated pipe protection for exposed cables at bridges, extra MS straps at location.

Technological solutions to prevent miscreant from tampering with railway assets should be found out.
<table>
<thead>
<tr>
<th>Section</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1.13</td>
<td>Training modules for all categories of staff should be finalized for each department at Board’s level and shortfall of training infrastructure should be made good on time bound programme basis. Training Instructors should be picked from the best available staff who have aptitude for imparting training. Monetary incentive to such trainers should be very attractive to draw them into training schools. A comprehensive training action plan should be drawn by each division and adequate cushion should be provided by creating trainee posts.</td>
</tr>
<tr>
<td>8.1.14</td>
<td>Requisite tools and machinery for ease of maintenance should be made available in all work spots without fail.</td>
</tr>
<tr>
<td>8.1.15</td>
<td>Gazetted and non-gazetted organization for maintenance of newly created infrastructure should be sanctioned as per norms along-with creation of new assets.</td>
</tr>
</tbody>
</table>
8.1.18 Attendance of staff in all the workshops and open line should be tightened up. Once this is done, not only manpower shortage in most areas will come down but quality of maintenance of assets will also improve. GM (S&T) to ensure compliance.

8.3 Reporting, monitoring, decentralization and accountability norms

8.3.1 The existing system of Monitoring of asset failures and analysis needs to be modernized. IT based systems for monitoring of asset performance and feedback between the line staff and depots should be introduced early. The software that is being developed by the MIS directorate now for this purpose should be robust and versatile enough to take care of this need comprehensively. The proposed system, inter alia, should provide connectivity among various zones, divisional control offices and field units and be capable of generating exception reports required at various levels of management viz. Railway Board, zonal HQs, departmental heads and so on. Railways to note these recommendations for compliance. Railways have been advised vide letter no. 2005/SIG/SEM/8 dt. 4.10.2005 for computerization of Signal incidences, analysis of signal failures utilising software developed by CAMTECH Gwalior and computerized monitoring of maintenance etc.

8.3.2 Asset failures should be classified under one of the following broad categories:-
(i) Defective design.
(ii) Defective material
   (a) failure arising out of prolonged use of unserviceable material due to non-availability of stores.
   (b) premature failure due to poor quality of stores.
(iii) Bad workmanship by the field maintenance unit.
(iv) Bad workmanship by workshop.
(v) Mismanagement by the Operator.
(vi) Failure due to extraneous causes.
(vii) Failure due to over usage of asset.
Action plan for improvement in maintenance practices has been issued vide Railway Board’s letter no. 2005/SIG/SEM/8 dt. 4.10.2005.

8.3.3 The Individuals officers controlling the field units should be encouraged to report failures truthfully and correctly so that all the failures get registered and analyzed. Non-reporting of an asset failure should be viewed very seriously and the individuals involved in hiding of failures be dealt with severely. CSTE’s have been advised during the meeting held on 29/30.09.2005 to report failures as per station records.
8.3.4 Every failure affecting train operation should be reported to the zonal railway headquarters office and Railway Board under the following category.
(a) Train operations affected upto 10 minutes
(b) Train operations affected upto 11-30 minutes
(c) Train operations affected upto 31-60 minutes
(d) Train operations affected more than 60 minutes

Railways to note these recommendations for compliance.

- Consolidated targets for Signal defects/failures: As per the para 6.12 of the Corporate Safety Action Plan, the consolidated target of all types of Signal defects is laid down as follows:
  Reduction of incidents per thousand workload of Zonal Integrated Signal And Telecom Units (ZISTUs) to 7.91 by 31.3.2008 and 5.28 by 31.3.2013.

The targets should be achieved in the following manner:

<table>
<thead>
<tr>
<th>S.N</th>
<th>YEAR</th>
<th>Target of incidents per thousand workload of Zonal Integrated Signal And Telecom Units (ZISTUS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2006-2007</td>
<td>8.43</td>
</tr>
<tr>
<td>2</td>
<td>2007-2008</td>
<td>7.91</td>
</tr>
<tr>
<td>3</td>
<td>2008-2009</td>
<td>7.38</td>
</tr>
</tbody>
</table>

- Consolidated targets for failure of telecom assets: As per the para 6.13 of the Corporate Safety Action Plan, the efficiency of Safety and operation-related Telecom circuits should be improved to 99% by 31.3.2008 and to 99.5% by 31.3.2013. In respect of control, LC gate & block circuits' working on OFC-cum-Quad cable, the targets should be achieved in the following manner:

  Within one year from the date of commissioning of the OFC-cum-Quad cable system – 97%. 2nd year of commissioning – 98%, and 3rd year of commissioning – 99%.

The above action plan should be implemented w.e.f. 1.2.2006.

This issues with the approval of Board (ML).

(P.K. GUPTA)
Director(Signal)
Railway Board.

Copy to: 1. Director General (Signal & Telecom)/RDSO.
2. Director/IRISET
Chief Signal & Telecom Engineers
All Indian Railways.

Sub: - Track Circuit – Welded Bonds and Jumpers.

Presently single core signalling cable, GI wire rope and 8 SWG GI wire are used as track bonds and jumpers. GI wire and wire rope are prone to corrosion and rusting. The signalling cable connection is theft prone. With a view to increasing the reliability and performance of track circuits, RDSO in their report on “Track Circuits – A Critical Review” circulated vide letter No. STS/E/DC track circuit dated 4.9.2002 have recommended use of exothermic welded bonds under the brand name CADWELD.

2. RDSO have further advised that field reports have confirmed general improvement after use of such bonds/jumpers connection with regard to reliability and performance parameters of the track circuits. The annual cost of a such a bond is also reported to be lower than the conventional channel pin and GI wire bond.

3. The provision of CADWELD connections was recommended during the 7th MSG meeting held at Secunderabad on 25th & 26th Nov., 2000. The recommendations duly approved by the Railway Board were circulated to Railways vide RDSO’s letter No. STS/E/7th MSG dated 13/14-2-2001.
4. RDSO vide their letter No. STS/E/Cadweld dt. 4.10.02 have again advised the railways to use CADWELD type welded joints for track circuit connections instead of channel pin connections to improve reliability of track circuits and to reduce annual maintenance cost.

5. Now, 90 UTS rails have also been adopted by Indian Railways for mass utilisation. These rails are sensitive to bad handling practices. Further the Track Directorate of RDSO have issued instructions not to drill holes in 90 UTS rails unless required for operational use. Therefore, only welded joints should be provided in 90 UTS rails.

6. In view of the foregoing, the railways are advised to use welded bonds for track circuit connections as per recommendations of RDSO. Care should however be taken that the jointing materials should be purchased only from RDSO's recommended/approved sources and that such joints are made properly so as to achieve intended performance.

This has the approval of the Board (ML).

(Anshul Gupta)
Director (Signal)
Railway Board

Copy to: Sr. ED/Signal/RDSO. A general specification of such bonds may be issued early for wider availability and guaranteed performance as advised vide AM/Signal/Railway Board's letter of even number dated 5-12-2002.
My Dear Himanshu, Sinha & Srivastava,

Sub: Action plan for improvement in reliability of the signalling equipments.

While reviewing the above-mentioned plan, the provision of exothermic bonds in place of conventional track circuit bonds has caught my attention specifically. I am happy to note that this railway has already gone in a big way for exothermic bonds. These bonds are especially useful on sections provided with PSC sleepers where the track maintenance is carried out by track machines. Due to their small size (in case of through bonds) and the strength of their bonding with the rails due to exothermic process, which is similar to the one adopted in track welding, these exothermic bonds are eminently suitable for routes provided with PSC sleepers. They are also useful on those routes where PSC sleepers are yet to be provided since they lead to a drastic reduction in the cases of bond wire breakage by miscreants etc. Therefore, our aim should be to achieve 100% replacement of conventional bonding with the exothermic bonds. This is especially important in view of the latest thinking in Railway Board to achieve zero percent asset failure.

2. It is seen that out of the three divisions only ALD division is presently taking this work forward. The AGC division, after having completed the main line from PWL-AGC, has stopped doing any further work. They should start showing progress on the branch lines also. JHS division has yet to start this work. They should also take up this work in right earnest and should try to come up at par with ALD division if not exceed it.

3. This work involves bonding with rails using exothermic process which is a complex process involving changes in the metallurgy of the rails. Hence, this work must not be got done through unskilled or semiskilled persons employed by contractors. To ensure proper quality of work, a clause must be included in all contracts making it mandatory for the installation to be done by the trained personnel of the manufacturer in case of Indian manufacturer and in case of foreign manufacturer, by the trained personnel of their authorized representative in India.

4. Efforts should be made to charge this work against the works of track renewals. Wherever the same is not possible, the works should be got sanctioned through LAW BOOK 2006-07 under PH-33, where the cost limit for individual works under safety head is Rs.50 lakhs.
5. I expect that all the three divisions shall take up this work in right earnest and shall show some progress within the current financial year.

    With best wishes,

Yours Sincerely

(H.K. Agarwal)

Shri Himanshu Mohan
Sr. DSTE/ALD/NCR

Shri D.K. Sinha
Sr. DSTE/JHS/NCR

Shri A.K. Srivastava
Sr. DSTE/AGC/NCR
Presently single core Signalling cable and GI wires are used as track bonds and jumpers in track circuited areas in station yard. These wires are prone to corrosion and theft and are required to be renewed at every six months. Moreover these wires are required to be connected to rails by drilling holes on the web of rail and fixing bolts with pins. Also in due course, these connections start offering high electrical resistance due to getting rusted in pin holes and also get cut inside the hole thereby resulting in failures of track circuits, causing detention to trains. The electrical continuity fails intermittently in these type of connections, due to the wire and pin connections got loosened in due course and causes one time signal failure and the failure disappears subsequently. It is very difficult to detect such failures.

Track directorate of RDSO has issued instructions not to drill holes on rails and hence only alternative is to use welded joints without drilling holes on the rails. RDSO has conducted the trials and Rly Board has approved the use of exothermic welded joints instead of conventional track connections with channel pin to improve the reliability. RDSO has confirmed the improvement of track circuit functions after use of welded joints with regard to reliability and performance parameters of the track circuits. Also annual cost of welded bond is less than the conventional channel pin and GI wire bond.

Another advantage of exothermic welding system are: Strength of bond is more thereby improving the reliable working of track circuits, no drilling of holes on rail which prevents rail fracture due to holes, reduction in maintenance efforts etc.
Dated 10-12-1999

Sub. 'CADWELD' brazing method for bonds, earthing etc.

A trial-demonstration on 'CADWELD' aluminothermic welding process for fixing bonds etc. was arranged at RDSO by M/s L'ERICO, Australia along with their authorised distributors M/s Arilahnt Enterprises, Mumbai. Cadweld aluminothermic welding process has following advantages over traditional method of fixing bonds, earthing etc. by drilling holes in rail structures etc.

i) Stronger and more reliable electrical connectivity.

ii) No drilling of holes on rail etc. is required to be done.

iii) Corrosion resistant.

iv) Difficult to tamper with.

v) No special training required.

vi) No maintenance required such as regular tightening of nuts and bolts.

vii) Longer life of connections - ensure greater reliability.

Information booklet containing details is enclosed herewith. This method of connecting bonds, earthing etc. may be tried in limited way for connecting bonds to structures, connecting bonds, earthing etc. at TSSs, SSs which are not required to be opened frequently for other purposes such as mechanised track maintenance. Report on the performance should be sent to RDSO.

DA. As above

(Rajesh Tripathi)
For Director General/TI

Copy to: M/s Arilahnt Enterprises, H-54, Sumer Nagar, (Near Fly Over Bridge), S V Road, Borivali (W), Mumbai-400 092
No.230-Elect/TRD/4

Sr.DEE/TRD,
N.Railway,
ALD, DLI, UMB & LKO.

Sub : CadWeld method for bonding and Earthing.

RDSO vide letter no. T/101/BOND/99 Dated : 10.12.1999 has issued instructions for trying CADWELD method for fixing bonds, earthing etc. following which M/s.ERICO the original CADWELD manufacturer along with its authorized dealers gave demonstration to the electrified divisions and the process has been reported to be satisfactory.

As suggested by RDSO the Cadweld method of bonding would be helpful in the following:

- Stronger and more reliable electrical connectivity.
- No drilling of holes on rail etc. is required to be done.
- Corrosion resistant.
- Difficult to tamper with.
- No special training required.
- No maintenance such as regular tightening of nuts and bolts.
- Longer life of connections – ensures greater reliability.

In view of RDSO instructions CADWELD method should be used for connecting bonds to structure, bonds to rail & earthing etc. without drilling of holes in rails/structures.

Since it being a safety and to derive the full benefits as envisaged above, the CADWELD bonding should be carried out only by original CADWELD manufacturer or his authorized dealers whose people have undergone training on the equipments.

Information booklet containing details is enclosed herewith. Report on the performance should be sent to Headquarter for onward submission to RDSO.

(Narottam Das)
Chief Elect. Distribution Engineer.
WHAT IS EXOTHERMIC WEDLING

An exothermic connection is actually a molecular bond formed between 2 metals such as copper and steel. Copper oxide and aluminum are combined and ignited. The result is an exothermic reaction that produces molten copper and aluminum oxide slag. The molten copper melts the objects being connected together forming the molecular bond. This bond will not loosen overtime or deteriorate with age. The connection's current carrying capability is to that which it is being connected.
RDSO’s INSTRUCTIONS

MANUAL OF INSTRUCTION ON HANDLING OF RAILS ISSUED BY RDSO IN JULY 2000 PRESCRIBES THAT NO HOLE SHOULD BE DRILLED IN RAIL UNLESS THEY ARE REQUIRED FOR OPERATIONAL USE.
WHY?

EXOTHERMIC WELDING
RDSO’s OBSERVATIONS
STRONGER
AND
RELIABLE
ELECTRICAL CONNECTIVITY
NO DRILLING
NO HOLES
IN THE RAIL
REQUIRED
NON CORROSIVE
DIFFICULT TO TAMPER
NO SPECIAL TRAINING REQUIRED
NO REGULAR MAINTANANCE SUCH AS TIGHTNING OF NUTS AND BOLTS
LONGER LIFE ENSURES GREATER RELIABILITY
APPLICATIONS OF EXOWELD EXOTHERMIC WELDING
KIT FOR CONTINUITY BONDS
WELD METAL # 25gms
TOOL FOR TLJB/BOOT LEG RAIL WEB APPLICATION
Avec's Team Training Railway Staff for Application of Exothermic Welding
CLEANING OF RAIL TO REMOVE RUST
HEATING RAIL TO REMOVE MOISTURE
FIXING OF TOOL TO RAIL WEB
POURING WELD METAL IN MOLD
IGNITING WELD METAL
EXOTHERMIC REACTION
UNDER PROGRESS
CONTINUITY BOND ON RAIL HEAD
TLJB/BOOT LEG APPLICATION
CABLE WELDED TO RAIL WEB
**TRACK CIRCUIT MAINTENANCE TOOL KIT**

(EXOTHERMIC WELDING APPLICATION)

1. Exothermic Welding Kit (Head Application) - Continuity Bonding
2. Welding Tool - Continuity Bond (Head Application)
3. Welding Tool-TJEB/ Bootleg (Web Application)
4. Replacement Mould (Web Application)
5. Exothermic Welding Powder # 25 Grams
6. Copper Sleeves
7. Hammer Die
8. Flint Ignitors
9. Mould Cleaner
10. Grinding Machine Rechargeable Battery Operated
11. Track Grinder Wheel
12. Blow Lamp
13. Pair of Gloves
14. Eye Protection Glasses
15. Torch Battery Operated
16. Digital Multimeter (Fluke Make or Similar)
17. Tools - Spanner, Hammer etc.

**TRACK CIRCUIT MAINTENANCE TOOL KIT**
@ Rs. 1,85,000/- Plus Taxes
AUDIO FREQUENCY TRACK CIRCUITS ( AFTC )
CABLES WELDED BY EXOTHERMIC WELDING
CLEANING OF RAIL WEB TO REMOVE RUST, DIRT & OIL
CABON MOLD ATTACHED TO RAIL WEB FOR AFTC CABLE WELDING BY EXOTHERMIC WELDING
WELD METAL POURED IN CARBON MOLD
EXOTHERMIC WELDING IN OPERATION
AFTC CABLE WELDED TO RAIL WEB BY EXOTHERMIC WELDING
STUD WELDED TO RAIL WEB
THIMBLES WHEN ATTACHED WITH CABLES WOULD BE TIGHTEN ON THE STUD
EARTHING APPLICATIONS BY EXOTHERMIC WELDING
SIGNAL POST EARTHING APPLICATION
CABLE TO CABLE AND POLE APPLICATION
THANKS FOR YOUR VALUABLE TIME