



# THERMIT WELDING (GB) LTD

## PROCESS MANUALS



### SECTION FOUR

## GUIDELINES FOR SAFE OPERATION



## SECTION 4 - GUIDELINES FOR SAFE OPERATION

The information contained in this section is applicable to the THERMIT® Welding Processes, and is advisory only. Reference shall also be taken to local instructions for safety requirements associated with the welding site.

**Thermit Welding is classed as a Safety Critical Activity, and all operators must have attended a training course approved by The Company and be in possession of a valid Permit or Certificate of Competence for the process.**

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## 4.1 INTRODUCTION

These advisory notes cover execution of the welding process only. It is assumed that the welding process is being undertaken by fully trained welding operators and that the correct written Thermit® Welding procedures are being followed, using approved equipment and that normal, sensible, behaviour prevails. The consequences of some unauthorised or "bad" practices are included.

These guidelines are for reference in preparation of risk assessments and should not be taken as complete. The degree of risk and persons at risk shall be assessed by each user and for each site.

Hazards associated with the Aluminothermic process are minimised by appropriate welder training supported by reference to Thermit® Welding Procedures, local safety instructions, use of safety protection, and correct maintenance and use of associated plant. Where appropriate, further notes and references are given.

The guidelines do not cover:

- Hazards that is particular to a given site, such as access, poor visibility (lighting), overhead power lines, electrified lines, working at height, movement of vehicles, etc.
- Hazards associated with the transport of welding equipment to and from the place of working, and issues associated with safety of personnel in or about a railway or similar site
- Hazards associated with the use of incorrectly maintained or unserviceable portable powered plant (e.g.: Generators, abrasive disc cutters, grinding machines).
- Any actions or omissions that may compromise the quality of finished welds, unless those actions or omissions present an immediate and direct personal risk involving the welding process.
- Any non-direct and immediate risks arising from poor quality.

## 4.2. SPECIFIC HAZARDS

### 4.2.1. BURNS

There are a number of activities during the welding operation where burns of varying severity might be sustained:

- Cutting of rail ends (Flame or Abrasive Disc).
- Hot rails (following rail end preparation, after welding and final grinding).
- Thermit Crucible drying, preparation for use (especially for manually tapped crucibles), during removal after tapping, or removal after failure to tap.
- During preheating process.
- From hot equipment such as cutting torch, preheater, weld trimmer, mould shoes (during removal), and crucible
- From splashes of molten or hot metal - which may arise during manual tapping, or from abnormal conditions such as a run-out or violent ejections from the crucible if water is present (wet portions, incorrectly dried crucible). Slag pouring into damp slag bowls.
- From sparks from rail cutting, the Aluminothermic reaction, rail grinding.



- Burns from fires and explosions

#### **4.2.2 FIRE**

Fires may occur as a result of poor practice or an accident and may involve bankside vegetation, wooden sleepers, rubbish, flammable gases, petrol or petrol driven equipment.

Associated causes are:

- Sparks from rail cutting, the Aluminothermic reaction, rail grinding.
- From splashes of molten or hot metal
- From explosion
- Incorrect disposal of hot slag, or excess Thermit steel.
- Welding close to wooden sleepers.

#### **4.2.3 EXPLOSION**

May only arise from bad practice and be associated with:

- Incorrect use of flammable gases (acetylene or propane).
- Molten metal and or slag coming into contact with water as a result of run out from moulds or crucible, or incorrect disposal of molten or hot solid slag.

#### **4.2.4 DAMAGE TO EYES**

Injury may arise from a number of causes during the welding process:

- Splintering of ballast or concrete sleepers resulting from shock heating from hot metal/slag splatter, carelessly directed cutting or preheating equipment, or during crucible drying.
- Splinters from poorly maintained tools.
- Fragments of flying slag during crucible cleaning and tapping thimble removal.
- Glare from burning igniters, Aluminothermic reaction and molten metal/slag stream.

#### **4.2.5 RUPTURE OF PIPES & HOSES**

Pipes or Hoses may become damaged for the following reasons:

- Rupture of oxygen or fuel gas hoses under excess pressure, damaged by abrasion, cutting or burning during flame cutting, crucible drying and preheating.



- Rupture of Nitrogen or compressed air hoses for manual trimming or use of fume extractor.
- Bursting of hydraulic hoses or pipefittings on weld trimmer.

#### **4.2.6 MANUAL HANDLING**

A number of items of equipment are heavier than the recommended safe lifting load for one person. The manner in which the welding equipment is loaded for transit and restrictions with respect to site access shall also be considered. Working with equipment at rail level also increases the risk of back strain, etc.

#### **4.2.7 FLYING OBJECTS**

Risks may arise from flying components, such as:

- Rail fastenings during removal, and replacement.
- Cold weld risers, lumps of mould during removal.
- Broken cutting discs or grind stones.

#### **4.2.8 NOISE**

The risk of hearing impediment can occur during disc cutting, chisel trimming, and profile grinding.



## 4.3 GUIDELINES FOR SAFE OPERATION

Risks may be eliminated or limited by sensible working practices, and reference to advice included in welding documentation, and training methods.

### 4.3.1 WELDER TRAINING AND CERTIFICATION

Only welding staff who have attended an approved Thermit® Welding training course and hold a valid certificate of Competence are authorised by Thermit Welding (GB) Ltd. to use their processes and welding procedures. The Training course provided by Thermit Welding (GB) Ltd. includes extensive tuition on safe working practice, supplemented by provision of safety information, and written and practical testing on safety.

All welders should also hold an abrasive wheel certificate and have received instruction in the use and care of portable powered plant.

### 4.3.2 WELDING PROCEDURES

Welding procedures issued by Thermit Welding (GB) Ltd. include guidelines for the safe use of the process.

### 4.3.3 SAFETY PROTECTION

Safety protection should be provided to welding operators, and should include:

- Protection from Burns.
- Nomex Gauntlets or Mitts
- Flame retardant Overalls or Boiler Suit
- Foundry Boots
- Protective gaiters
- Eye protection
- Clear protective goggles - BS EN 166B
- Welding Goggles - BS 679 shade 5/6 GW
- Ear Protection
- Ear Muffs



#### **4.3.4 C.O.S.H.H.**

A full assessment of the product hazards have been made - data sheets are available on request.

#### **4.3.5 SAFE USE OF GAS EQUIPMENT**

Instruction is provided on the inspection, assembly and use of Gas equipment, and the following literature is available, and distributed as part of our training course.

"Safe under Pressure" BOC booklet

All gas equipment should be tested at regular intervals, in accordance with local instructions.

#### **4.4 RECOMMENDATIONS FOR STORAGE AND DISPOSAL**

##### **4.4.1 GENERAL**

These recommendations represent "Best Practice" with respect to storage of materials, however it is probable that restrictions on space, access, weight, etc., may result in some amendments to them – in such cases the company will be pleased to offer more individually tailored advice.

Stores should be dry, well ventilated, and where required heating, lighting, power and running water should be available. In all cases building construction should be in compliance with the FIRE regulations applicable to the substances being stored. Consideration shall also be given to the HSE and C.O.S.H.H. regulations at all times.

The appropriate HAZ CHEM Notices should be displayed where hazardous materials such as Thermit Portions and Igniters are stored. These are indicated below.

##### **4.4.2 SINGLE USE CRUCIBLE (SUC) & THERMIT PORTIONS,**

Single Use Crucibles and Thermit Portions should be stored UPRIGHT in a secure, non-combustible building. While it is preferable that they should be stored separately, they may be



stored with other non-flammable materials, such as equipment and small tools, moulds, luting sand in sealed bags, etc. – in which case ideally they should be segregated. The store should be dry with ventilation to prevent excess humidity or dampness, and designated as a no-smoking area, with no naked flames.

Appropriate notices should be displayed inside and outside the building together with the standard warning sign, which should read “Metallic Powder in case of fire **DO NOT USE WATER**”.

Single Use Crucibles and Portions must not be stored in the same building as explosive or flammable items (e.g. Fuel, fuel gases, and igniters).

Thermit portions are supplied in polypropylene tubs which should not be stacked more than 4 high. If pallets containing tubs are to be stored more than 1 high then post pallets or racking should be provided.

Single Use Crucibles are supplied as 36 to a pallet (gross weight ~1tonne) which should not be stacked.

The sealed Thermit Portion tub must not be opened until immediately prior to use. Single Use Crucibles require no preparation prior to use. Any spillages should be immediately swept up and the materials disposed in accordance with safety data sheets or returned to Thermit Welding (GB) Limited for proper disposal. Steel shovels should not be used on concrete floors, which might create a spark.

The Local Fire Brigade should be informed of exact location of store and nature of contents. Only dry powder extinguishers Class D should be used in the proximity of Thermit powders.

**NOTE:** The Aluminothermic reaction reaches very high temperatures and cannot be extinguished.

**HAZ CHEM** Notice to be displayed outside the Building is **4Y**

#### **4.4.3 IGNITERS**

Tubes of igniters should be stored in a locked steel cupboard, or other secure steel container. On no account must these be stored in the same building as the portions.

The **HAZ CHEM** notice to be displayed is **2Y**





#### **4.4.4 STORAGE OF CRUCIBLE LININGS, MOULDS, LUTING SAND AND EQUIPMENT**

The store should be large enough to allow stock to be segregated, stacked and identifiable. Heating should be adequate to prevent condensation.

##### **Preformed moulds**

The “Old” boxes contained moulds packed on two layers. They should not be stacked more than 5 high. The “New”, boxes contain moulds packed on one layer. They should not be stacked more than 6 high. The description on each box should remain visible. Boxes should not be opened until immediately prior to use.

##### **Re Usable Crucible Linings**

The crucible lining is individually packed in boxes which may be stacked 3 high.

##### **Luting Sand**

Sand is supplied in either 25kg bags (5 welds) or 5 kg bags (1 weld). Sand may be stored outside but should be protected against low or high temperatures, and wet weather. The sand is a naturally occurring material and is non-hazardous.



#### **4.4.5 GUIDELINES FOR DISPOSAL OF THERMIT® MATERIALS**

These guidelines are for the safe disposal of Thermit Welding consumables. Information on the content of Thermit portions and igniters is given in our safety data sheets, together with measures that should be taken following accidental release (spillage).

Disposal of any waste material should be made via an appropriately licensed waste disposal organisation.

##### **Thermit powder**

Please contact Thermit Welding (GB) Ltd for advice on safe disposal.

Alternatively the powder may be mixed with 5 or 6 times their volume of an inert material, such as dry sand, in order to make them un-ignitable before disposal.

##### **Thermit igniters**

These may be returned to Thermit Welding (GB) Ltd for disposal.

##### **Thermit moulds, long life crucibles, luting sand**

These do not contain materials that are considered hazardous for disposal and should be treated as general industrial waste.