EXPERT TECHNOLOGY TOOLS

WTIA

Welding Technology Institute of Australia

TGN-R-05

Flame Cutting of Rail

1.0 Objective

This document provides information on the flame cutting of rail using Oxygen - Fuel gas cutting. For most applications where rails are to be joined by Aluminothermic welding it is permissible to have flame cut ends. As the aluminothermic welding process has to melt the rail ends in forming the joint, it is essential that a good quality cut surface is obtained.

2.0 Quality

The cut surface needs to be free of deep gouges, excessive roughness, thick or loose scale or other defects which can cause problems during welding.

3.0 Free hand cutting

Due to the complex shape and changes in thickness of rails in conjunction with the fact that trimming of rail ends for setting gaps and preparing joint faces for aluminothermic welding is carried out at ground level on track makes cutting a difficult process.

Totally free hand cutting of rail is not generally recommended as it is extremely difficult keeping the correct nozzle to work piece distance around the rail profile and perfectly square cuts are difficult to achieve. Making use of a set of rollers run against a cutting guide maintains a constant nozzle to work piece height and assists in producing a good and straight cut.
Generally a lot of training and skill is required on the part of the operator.

Figure 1. Example of cutting guide with handle and locking screw fitted on rail

Figure 2. Cutting in progress showing wheeled nozzle guide running against cutting guide

4.0 Preheating

The composition of rail steel makes it highly hardenable and the cutting process may lead to the formation of hardened zones adjacent to the cut surface. Preheating of the rail is recommended to reduce the possibility of a hardened zone and to decrease risk of cracking.
Preheating to 100 ^{o}C minimum is recommended and is the preheating temperature generally applied in industry. Preheating should not exceed 300 ^{o}C and should be applied evenly on and 25mm either side of the cut line. Avoid hot spots.

5.0 Cutting defects, their causes and prevention

Cutting Condition	Cut appearance	Correction
Correct cutting	Both top and bottom edges sharp and cleanly defined Even vertical drag lines Oxide/slag easy to remove	None
Cutting speed too fast	Backward rake of drag lines Top edge may be beaded and not sharply defined Difficult slag removal	Decrease travel speed
Cutting speed too slow	Extensive gouging of cut face Slag adhesion and difficult slag removal particularly to lower face Top edge rounded	Increase the travel speed Increasing the Oxygen pressure is often required as well
Nozzle too high	Melt off and rounding of the top edge Undercutting of the face due to the oxygen stream opening out	Use correct stand off distance between the nozzle and the work piece
Nozzle too low	Excessive melting and beading of top edge Drag lines can be exaggerated	Increase stand off distance between the nozzle and work piece to the correct level
Insufficient preheat	A horizontal ridge appears part way down the cut face and the appearance of top and lower part of cut is different	Allow a longer initial period for preheating Select a larger cutting nozzle with a increased preheating flame size
Excessive cutting oxygen pressure	Excessive kerf width at top of face with severe Undercutting at top of face with a regular bead at the top edge	Reduce oxygen pressure
Dirty nozzle (gives very irregular oxygen flow and distorted oxygen stream).	Irregular drag lines with poor and irregular profile. Frequent generally deep gouges of narrow width, more severe in the bottom of the cut	Clean nozzle

References

WTIA Technical Note 5 *Flame cutting of steels 1994*

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As a valued technology expert in this area we would like you to be part of the Technology Expert Group to review this note. Please complete this questionnaire so that we can gauge the success of meeting this need.

Objective 1: Identify the need for quality cutting of rail.
Flame cutting is used as a standard method for cutting rail to length and for preparing weld ends for aluminothermic welding. This guidance note is intended to provide the Rail Industry with advice on producing good quality flame cut edges. How well does the document achieve these aims?

poor ☐ average ☐ good ☐ very good ☐

Comments:

Objective 2: Identify appropriate technology receptors
This document was written for Maintenance Engineers, Maintenance Contractors and Welding Coordinators in the Rail Industry. Are these people the appropriate individuals we should be targeting?

yes ☐ no ☐

What other types of companies and/or personnel do you suggest we target?

Objective 3: Identify current best practice for cutting rail
The document was written to reflect current best practice for the flame cutting of rail components. Do you envisage opportunities for the use of this practice in industry?

yes ☐ no ☐

If yes, what and where, if no why not?

Objective 4: Is the information provided clear, concise and accurate?
yes ☐ no ☐

If not, why?

Objective 5: Broad dissemination of technology to the Rail Industry
Please indicate how best to disseminate this Technical Guidance Note to the appropriate Industry Recipients

Free Website Download ☐ Poster ☐ Pocket Guide ☐ Pamphlet ☐

If poster, what size? A1 ☐ A2 ☐ A3 ☐ Laminated ☐ What selling price? $

If a pocket guide, what selling price? $

Other format?

Objective 6: Continuous Improvement

Please Identify areas where the document can be improved or return the document with your recommended additions/amendments. Alternatively, please use the area below to provide any additional comments.

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