

Welding rails using the aluminothermic welding process

Overview

This standard identifies the competences you need to produce satisfactory welds on site in steel rails using the aluminothermic welding process, in accordance with approved procedures. In this context, steel rail means grades and profiles as used in the UK permanent way rail infrastructure.

You will be required to check that all the welding and ancillary equipment such as saws, grinders and shearing tools are available and in a usable condition. You will be expected to check that gases are available and that gas equipment, burners and hoses are of the correct type, securely connected and free from leaks and damage. You will also need to ensure that appropriate crucibles, moulds and portions are available and in good condition. In preparing the weld, you will need to identify the rail material and section and to take account of any wear on the railhead. You will be expected to prepare the joint area and the welding equipment, to make and finish the weld, and to provide instructions to your assistant. You must operate and handle the equipment safely and correctly, and make any adjustments to equipment or settings in line with your permitted authority, in order to produce and finish the welds to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or the welding activities, that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and those of your assistant, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will provide an informed approach to applying the aluminothermic welding procedures. You will understand the equipment, materials and consumables used, in adequate depth to provide a sound background for the welding operations to be performed, recognising and correcting faults, and for ensuring the work output is produced to the required specification. Visual inspection of your work is implied.

You will understand the safety precautions required when working with the welding equipment, and will be required to demonstrate safe working practices throughout. You will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant joining procedure and job instructions
3. check that the joint preparation complies with the specification
4. check that joining and related equipment and consumables are as specified and fit for purpose
5. make the joints as specified using the appropriate thermal joining technique
6. produce joints of the required quality and of specified dimensional accuracy
7. shut down the equipment to a safe condition on completion of joining activities
8. deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
9. deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when working on rail construction sites using aluminothermic welding equipment (rail site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers, accident procedure; statutory regulations; client requirements)
2. the hazards associated with aluminothermic welding (poor gas supply, leaks, hot metal, and exothermic reactions), and how they can be minimised
3. extracting information from procedure specifications
4. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
5. the different types of rail materials, sections and rail support and attachment systems
6. rail wear and rail alignment
7. the equipment and consumables used for aluminothermic welding
8. the aluminothermic welding process and use of the process manuals
9. setting up the joint (such as cutting, alignment, moulds, luting)
10. setting up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (gas supply, correct joint set-up, cleanliness of materials used)
11. the techniques of operating the welding equipment to produce a range of joints in accordance with the appropriate process manual
12. the importance of complying with job instructions and the welding process specification
13. problems that can occur with the welding activities and how these can be overcome; effects of welding on rail materials and sources of weld defects; methods of prevention
14. rail stressing and the use of tensor equipment
15. finishing welds (removal of risers, shearing and grinding)
16. the procedures to be followed to ensure the track is correctly reinstated on completion of the welding activities
17. the organisational quality systems used, finished weld acceptance criteria and weld standards to be achieved, weld inspection and test procedures used, including visual inspection and non-destructive tests

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18. weld sentencing and actions to be taken if the finished weld is not acceptable
19. personal approval tests and their applicability to your work
20. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1.

Carry out **all** of the following in accordance with applicable specifications:

- 1.1 confirming welding equipment, consumables and ancillary equipment is available and fit for purpose
- 1.2 identification of rail and measurement of rail wear
- 1.3 cutting the rail using the oxy-fuel process, a band saw or an abrasive disc
- 1.4 aligning the rail and datum marking (reversed logical)
- 1.5 preheating the crucible and the joint area
- 1.6 joining the rails using safe and approved welding methods and procedures
- 1.7 re-instating the track to the required standard on completion of the welding activities
- 1.8 disposing of waste and surplus materials in accordance with approved procedures

2.

Set up, check, adjust and use aluminothermic and related welding equipment for **one** of the following process variants, in accordance with the appropriate process manual:

- 2.1 Thermit
- 2.2 Railtech
- 2.3 other manufacturers equipment

3.

Use moulds and consumables appropriate to the material and application, to include **all** of the following:

- 3.1 join new rail to worn rail
- 3.2 two different rail materials
- 3.3 worn to worn rail
- 3.4 producing composite welds

4.

Weld joints according to approved welding procedures in **both** of the following:

- 4.1 normal gap
- 4.2 wide gap

5.

Produce welds which meet **all** of the following quality and accuracy standards:

- 5.1 achieve a minimum weld quality required by the application standard
- 5.2 meet the required dimensional accuracy within specified tolerance
- 5.3 have been finished to the required specification in terms of removal of risers and excess metal
- 5.4 are ground to the required standard

6.

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Check and record the welds by carrying out **all** of the following:

- 6.1 correctly applying tensor equipment
- 6.2 inspecting the weld and deciding on its acceptance
- 6.3 recording the weld and marking the rail accordingly

Behaviours

Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

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