

Overview

This standard includes high and low temperature – fusion and non-fusion techniques used in repair and manufacture. Joints should be formed using materials from 0.8 to 10mm in thickness. Joints can be formed on the bench or in position on machines or fixed equipment. This does not cover the repair of safety critical components.

This standard relates to the following application or context:

1. Use of welding and thermal joining techniques to join a range of ferrous and non-ferrous materials by means of:
 - 1.1. high temperature
 - 1.2. low temperature
2. Use of the following types of welding and thermal joining equipment:
 - 2.1. electric
 - 2.2. gas
 - 2.3. soldering iron
3. Use of the following joining techniques:
 - 3.1. butt
 - 3.2. lap
 - 3.3. fillet
 - 3.4. single run
 - 3.5. multi run
4. Using the following position and access:
 - 4.1. down hand
 - 4.2. positional
5. Identify faults caused by the following:
 - 5.1. inadequate preparation
 - 5.2. incorrect settings and or
 - 5.3. poor technique

Anyone undertaking mains electrical work must comply with current regulations.

**Performance
criteria**

- You must be able to:*
- P1 identify materials and their suitability for either welding, bronze welding or soldering processes
 - P2 prepare the workplace and equipment to carry out a thermal joining process
 - P3 prepare materials and joints to comply with specifications
 - P4 use the correct techniques to carry out thermal joining tasks
 - P5 join a range of ferrous materials producing joints of the required quality and dimensions
 - P6 identify faults in welded, bronze welded and soldered joints using appropriate inspection techniques
 - P7 inspect and maintain equipment and change consumables used in joining processes, e.g. clean gas nozzles, change gas cylinders and welding wire spools
 - P8 shut down equipment to a safe condition on completion of thermal joining activities

Knowledge and understanding

You need to know and understand:

- K1 how to identify ferrous and non-ferrous materials and their respective joining characteristics (similar and dissimilar), when using thermal joining procedures
- K2 preparation and joining procedures for joints to include butt, lap, fillet, single and multi-run joints, tacking, positioning and clamping
- K3 principles and techniques for joining ferrous or non ferrous materials using gas or electric welding and soldering methods
- K4 how to control distortion and weld defects
- K5 how to select, prepare and set the relevant equipment to carry out welding tasks, e.g. oxy acetylene, MIG/MAG, TIG, MMA, and soldering irons. To include setting pressures, and amperage, voltages, selecting electrode sizes, nozzle sizes and selection of fluxes for bronze welding and soldering
- K6 the properties and purpose of flux,
- K7 the function of welding slag and its removal
- K8 the range of techniques necessary to prepare material prior to welding
- K9 how to detect and correctly identify faults and their causes in welded joints using visual inspection, non destruction and destruction procedures, e.g. undercutting, slag traps, penetration, cracking and leak testing
- K10 the precautions required when engaging in a thermal joining process in particular, fumes, explosions, fire, sharp edges, airborne debris and personal injury

Glossary

Electric equipment

'Electric equipment' includes manual metal arc, metal inert gas and soldering equipment.

Gas equipment

'Gas equipment' includes Oxy acetylene.

Thermal joining

Thermal joining includes welding and non-fusion joining, e.g. soldering and brazing.

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Core land-based engineering principles – Thermal joining processes

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