

Overview

This standard covers a range of basic manual flame brazing and soldering competences that will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare the manual flame brazing or soldering activities by obtaining all the necessary job instructions, materials, tools, equipment and any documentation that may be required. You will also be expected to check the flame brazing or soldering equipment, and to ensure that the hoses and torch are securely connected and free from damage.

You must operate the equipment safely and correctly, and set and adjust the brazing or braze welding conditions, in line with instructions and safe operating procedures. You will need to be able to recognise basic brazing or soldering defects, to take appropriate action to limit any faults that occur and to ensure that the finished workpiece is within the specification requirements. On completion of the brazing or soldering activities, you will be expected to return all tools, equipment and workholding devices to their designated location, and to leave the brazing or soldering equipment and work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the brazing or soldering activities undertaken. You will need to report any difficulties or problems that may arise, and to carry out any agreed actions. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate manual flame brazing or soldering techniques and procedures safely. You will understand the brazing or soldering process, and its application, and will know about the equipment, materials and consumables used, to the required depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with the flame brazing or soldering equipment, and with its associated tools and equipment. You will be required to demonstrate safe working practices throughout,

and will understand the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

Brazed or soldered joints must be at least 100mm long, except for joints in pipe or tube.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. obtain and prepare the appropriate flame brazing or soldering equipment and consumables
3. prepare and support the joint, using the appropriate methods
4. tack the joint at appropriate intervals, and check the joint for accuracy before final brazing or soldering
5. produce brazed or soldered joints of the required quality and of specified dimensional accuracy
6. report any difficulties or problems that may arise with the brazing or soldering activities, and carry out any agreed actions
7. shut down the equipment to a safe condition on conclusion of the brazing or soldering activities
8. leave the work area in a safe and tidy condition on completion of the activities

Knowledge and understanding

You need to know and understand:

1. the safe working practices and procedures to be observed when working with manual flame gas brazing and soldering equipment (such as general workshop safety; appropriate personal protective equipment (PPE); fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume extraction/control)
2. the hazards associated with carrying out flame brazing and soldering activities (such as naked flames, explosive gas mixes, oxygen enrichment, fumes and gasses, hot metal, enclosed spaces), and how they can be minimised
3. the personal protective equipment to be worn for the brazing and soldering activities (such as correctly fitting overalls; leather aprons, eye protection with the appropriate shade of filter)
4. the correct handling and storage of gas cylinders (such as manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features)
5. how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
6. types and forms of filler metal and fluxes
7. the types of joint to be produced (such as lap, tee, corner, butt)
8. how to prepare the materials in readiness for the brazing and soldering activity (such as ensuring that the material is free from surface contamination (such as dirt or rust); ensuring that edges/surfaces to be brazed or soldered are correctly prepared (such as made flat, square)
9. setting up and supporting the joint (such as use of jigs and fixtures, restraining devices; self-locating joints; pre- placement of filler metal and flux)
10. how to prepare to braze or solder (such as checks to confirm the correct set-up of equipment, checking connections for leaks)
11. the correct use of the torch to produce a range of joints (such as selection of nozzle, adjustment of the flame, application of flux and the correct manipulation of torch and filler material)
12. the safe and correct sequence for shutting down the brazing or soldering equipment (such as sequence of turning off the gases, extinguishing the flame and closing valves on gas supply/cylinders)

Using manual flame brazing and soldering equipment

13. problems that can occur with the brazing or soldering activities (such as incorrect heat pattern (hot or cold spots); fluxing technique; formation of oxides during the process; distortion of the joint due to overheating), and how these can be overcome
14. methods of removing flux residues and cleaning the finished joint
15. how to check the brazed or soldered joints for uniformity, alignment, position, joint size and profile
16. when to act on your own initiative and when to seek help and advice from others
17. the importance of leaving the work area in a safe and clean condition on completion of brazing or soldering activities (such as isolation of gas supplies, safely storing equipment and consumables, removing and disposing of waste)

Scope/range related to performance criteria

1.

Prepare for the manual flame brazing or soldering process, to include carrying out **all** of the following:

- 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
- 1.2 check that hoses, regulators and valves are securely connected and free from leaks and damage
- 1.3 check/fit the correct size gas nozzle to the torch
- 1.4 check that a flashback arrestor and check valves are fitted (where appropriate)
- 1.5 set appropriate gas pressures
- 1.6 use the correct procedure for lighting, adjusting and extinguishing the flame
- 1.7 use appropriate and safe procedures for handling and storing of gas cylinders (where appropriate)
- 1.8 prepare the work area for the activities (such as positioning screens and fume extraction equipment)
- 1.9 prepare the materials and joint in readiness for brazing or bronze welding (such as cleaning of joint faces, setting up the joint, supporting the joint)
- 1.10 ensure that the work area is maintained and left in a safe and tidy condition

2.

Use **one** of the following manual flame processes and related equipment:

- 2.1 brazing
- 2.2 braze welding
- 2.3 soldering

3.

Use specified consumables, appropriate to the parent metals, to include **one** of the following:

- 3.1 self fluxing rods/solder
- 3.2 flux coated/impregnated rods
- 3.3 powder/paste flux and rods/solder

4.

Produce joints in **one** of the following materials or material combinations:

- 4.1 copper to copper
- 4.2 copper to brass
- 4.3 tin plate
- 4.4 brass to brass
- 4.5 copper to carbon
- 4.6 other appropriate materials

5.

Using manual flame brazing and soldering equipment

Produce joints, in good access situations, covering **one** of the following:

- 5.1 lap joints
- 5.2 Tee joints
- 5.3 corner joints
- 5.4 butt joints
- 5.5 socket joints

6.

Produce joints in the following positions: For brazing or soldering use **one** of the following:

- 6.1 horizontal flow
- 6.2 vertical down flow
- 6.3 vertical up flow

For braze welding use **one** of the following:

4. flat position
5. horizontal-vertical position

1.

Produce joints in **one** of the following forms of material:

- 1.1 sheet/plate
- 1.2 pipe/tube

2.

Produce brazed or soldered components which meet **all** of the following:

- 2.1 achieve the specified joint quality
- 2.2 meet the required dimensional accuracy within specified tolerance
- 2.3 are of good appearance, free from flux residues and excess filler metal

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

Developed by	Enginuity
Version Number	3
Date Approved	30 Mar 2017
Indicative Review Date	31 Mar 2020
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMPEO1-19
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies
Suite	Performing Engineering Operations Suite 1
Keywords	performing engineering operations; manual flame brazing; soldering; manufacturing; braze welding; materials; tools; equipment; defects; faults
