

# SEMFWE3-28 – SQA Unit Code HF31 04

## Joining fabricated components using mechanical fasteners



### Overview

This standard identifies the competencies you need to undertake the preparation and making of joints between fabricated components using mechanical means in accordance with approved procedures. You will be required to produce suitable and appropriate joints using appropriate methods for the materials to be joined that meet the specified conditions and subsequent operating conditions to be demanded of the joint. Particular attention will be needed in the preparation and finishing of the materials so that the finished component is fit for purpose and meets the level of accuracy required. The mechanical fastenings used will include rivets, self-tapping screws, bolts and screwed fittings, anchor nuts and proprietary fasteners as is appropriate to the application and/or specification. The joint will be of two or more materials and may include non-metallic materials and joints of dissimilar metals.

Your responsibilities will require you to comply with organisational policy and procedures, or those of the fastener manufacturers. You will be expected to seek out the relevant information and to report any problems with the mechanical fasteners or the joining 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 actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to the joining activities carried out. You will understand the basic characteristics of the materials to be joined, the various processes used and the appropriate procedures that go with them in adequate depth to provide a sound basis for achieving a sound and cohesive joint that is fit for purpose.

You will understand the safety precautions required when working with the tools and equipment, especially those for use in hot metal processes and the safeguards necessary for undertaking the using processes. You will be required to demonstrate safe working practices throughout, and will understand the responsibilities you owe to yourself and others in the workplace.

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### Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
  - P2 follow the relevant instructions, assembly drawings and any other specifications
  - P3 ensure that the specified components are available and that they are in a usable condition
  - P4 use the appropriate methods and techniques to assemble the components in their correct positions
  - P5 secure the components using the specified connectors and securing devices
  - P6 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
  - P7 deal promptly and effectively with problems within your control and report those that cannot be solved

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### Knowledge and understanding

*You need to know and understand:*

- K1 the specific safety precautions to be followed when working in a fabrication environment and when carrying out joining activities using fabricated components (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
- K2 the personal protective clothing and equipment that needs to be worn when carrying out the joining activities (such as leather gloves, eye/ear protection, safety helmets)
- K3 the hazards associated with the joining operations and how they can be minimised (such as handling sheet/fabricated components, using hot metal riveting techniques, handling and using sealants and cleaning agents, dangerous or badly maintained tools and equipment)
- K4 how to obtain the necessary drawings and joining procedure specifications
- K5 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)
- K6 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K7 the use of manufacturers' specifications for the types of fasteners used
- K8 the advantages and disadvantages of the different forms and methods of mechanical join
- K9 the various joining processes that are used and the tools and equipment that is required
- K10 the preparations that need to be carried out on the materials/components prior to joining them (such as, materials to be degreased, dry and clean, with hole and flanges de-burred)
- K11 how to set up and align the joints prior to fixing and the tools and methods that can be used (such as clamps, rivet gripping tools, temporary fixings, jacking and supporting devices)
- K12 how to produce a secure joint using blind rivets and the type of riveting tools that are available
- K13 how to produce a good solid riveted joint and the use of the various riveting tools
- K14 how to determine the length of the rivets required to give a properly formed rivet head
- K15 the range of bolts and screwed fasteners that are to be used; why it is important to use the correct type of washer; sequence of tightening bolts on flanged joints; and the tools and equipment used to ensure they are

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- tightened to the required torque
- K16 the various types of proprietary fasteners that are used on fabricated assemblies (such as anchor nuts, clinch nuts, welded studs etc.)
- K17 the materials used and their joining characteristics, electrochemical reaction between dissimilar metals and means of reducing the effects, use of gasket material
- K18 checks that need to be carried out on the tools and equipment prior to use to ensure that they are in a safe and usable condition (such as condition of plugs and leads on power tools, condition of striking faces on hammers, condition of riveting tools and rivet snaps)
- K19 equipment setting, operating and care procedures; why equipment and tools need to be correctly set up and in good condition
- K20 the importance of using the tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of preserving and storing tools and equipment between operations.
- K21 quality control and test procedures for detection of defects in joints, visual, feel and measurement checks
- K22 the problems that can occur with the joining operations and how these can be avoided
- K23 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
- K24 reporting lines and procedures, line supervision and technical experts

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### Additional Information

#### Scope/range related to performance criteria

*You must be able to:*

1. carry out **all** of the following during the joining process:
  - 1.1 correctly prepare the faces of the materials to be joined
  - 1.2 select the appropriate/specified fixings
  - 1.3 correctly align the materials and faces to be joined
  - 1.4 assemble the components in the correct order or manner
  - 1.5 produce a joint that meets the requirements of the specification
2. produce assemblies which include **six** of the following:
  - 2.1 flat and flanged joints on flat or curved surfaces
  - 2.2 joints with gasket or sealant
  - 2.3 square/rectangular trunking
  - 2.4 pipes
  - 2.5 circular trunking
  - 2.6 structural components
  - 2.7 access flanges and cover plates
  - 2.8 long or critical alignments
  - 2.9 tanks and tank covers
  - 2.10 permanent and temporary assemblies
3. use **four** of the following assembly methods and techniques:
  - 3.1 riveting using solid rivets
  - 3.2 assembling using bolt fittings
  - 3.3 riveting using pop/blind rivets
  - 3.4 using screw fittings to tapped components
  - 3.5 self-tapping screws
  - 3.6 nuts and (spot welded) screw studs
  - 3.7 use of proprietary fasteners
  - 3.8 locking methods and devices
  - 3.9 crimping
  - 3.10 clinching
4. join the components in **three** of the following joining positions, access and environmental conditions:
  - 4.1 horizontal
  - 4.2 vertical
  - 4.3 overhead
  - 4.4 in workshop conditions
  - 4.5 internal and confined spaces
5. produce joints to **all** of the following quality and accuracy standards as is applicable to the application:
  - 5.1 joints are accurately assembled and aligned in accordance with

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- the specifications
- 5.2 joints are secure and firm
- 5.3 bolted and screwed joints are tightened to the correct torque
- 5.4 riveted joints are free from excessive material deformation and hammer marks
- 5.5 pitch of holes meet the specification
- 5.6 completed joints are clean and free from burrs

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