

---

## Overview

This standard identifies the competences you need to undertake the preparation and making of joints between fabricated marine components, using mechanical means, in accordance with approved procedures. You will be required to produce suitable and appropriate joints, using the correct methods for the materials to be joined, in order to 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 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 with the joining activities that you cannot resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will 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 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.

---

## 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 instructions, assembly drawings and any other specifications
3. ensure that the specified components are available and that they are in a usable condition
4. use the appropriate methods and techniques to assemble the components in their correct positions
5. secure the components using the specified connectors and securing devices
6. check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. complete relevant documentation in line with organisational procedures

## Knowledge and understanding

### You need to know and understand:

1. the specific safety precautions to be followed when working in a fabrication environment and when carrying out joining activities using marine fabricated components (including general workshop and site safety, appropriate personal protective equipment, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations, safe disposal of waste materials)
2. the personal protective clothing and equipment (PPE) to be worn when carrying out the joining activities (such as leather gloves, eye/ear protection, safety helmets)
3. the hazards associated with the joining operations (such as handling sheet/fabricated components, handling and using sealants and cleaning agents, dangerous or badly maintained tools and equipment) and how they can be minimised
4. how to obtain the necessary drawings and joining procedure specifications
5. how to extract information from marine engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
6. how to carry out currency/issue checks of the specifications you are working with
7. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
8. the use of manufacturers' specifications for the types of fasteners used
9. the advantages and disadvantages of the different forms and methods of mechanical join
10. the various joining processes that are used and the tools and equipment that is required
11. the preparations to be carried out on the materials/components prior to joining them (such as materials to be degreased, dry and clean, with holes and flanges de-burred)
12. 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)
13. how to produce a secure joint using blind rivets and the type of riveting tools that are available
14. how to produce a good riveted joint and the use of the various riveting tools
15. how to determine the length of the rivets required to give a properly formed rivet head
16. the range of threaded 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

- 
- that they are tightened to the required torque
17. the various types of proprietary fasteners that are used on fabricated assemblies (such as anchor nuts, clinch nuts, welded studs)
  18. the materials used and their joining characteristics; electrochemical reaction between dissimilar metals and means of reducing the effects; use of gasket material
  19. checks to be carried out on the tools and equipment prior to use to ensure that they are in a safe, tested 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)
  20. equipment setting, operating and care procedures; why equipment and tools need to be correctly set up and in good condition
  21. 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
  22. the quality control and test procedures for detection of defects in joints (visual, feel and measurement checks)
  23. the problems that can occur with the joining operations and how these can be avoided
  24. 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 during the joining of the sheet metal components:
  1. correctly prepare the faces of the materials to be joined
  2. select the appropriate/specified fixings
  3. correctly align the materials and faces to be joined
  4. assemble the components in the correct order or manner
  5. produce a joint that meets the requirements of the specification
2. Produce assemblies which include six of the following:
  1. flanged joints on flat or curved surfaces
  2. pipes
  3. pre-fabricated square/rectangular components
  4. structural components
  5. pre-fabricated cylindrical/conical components
  6. light rolled section (angle, channel or tee section)
  7. access flanges and cover plates
  8. stiffeners and frame components
  9. tanks and tank covers
  10. long or critical alignments
  11. brackets
  12. permanent and temporary assemblies
  13. joints with gasket or sealant
3. Use four of the following assembly methods and techniques:
  1. riveting using solid rivets
  2. riveting using pop/blind rivets
  3. self-tapping screws
  4. use of proprietary fasteners
  5. crimping
  6. assembling using bolt fittings
  7. using screw fittings to tapped components
  8. nuts and (spot welded) screw studs
  9. locking methods and devices
  10. clinching
4. Join the components in three of the following joining positions, access and environmental conditions:
  1. horizontal
  2. in workshop conditions

- 
3. vertical
  4. internal and confined spaces
  5. overhead
5. Produce joints which meet all of the following requirements, as applicable to the application:
1. joints are accurately assembled and aligned, in accordance with the specifications
  2. joints are secure and firm
  3. threaded joints are tightened to the correct torque
  4. riveted joints are free from excessive material deformation and hammer marks
  5. pitches of holes meet the specification
  6. completed joints are clean and free from burrs

---

## Behaviours

### **Behaviours:**

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

SEMME3157

Joining marine sheet metal components using mechanical fasteners



Developed by	Enginuity
Version Number	3
Date Approved	31 Mar 2019
Indicative Review Date	29 Apr 2021
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMME3157
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	Engineering; marine; joining; sheet metal; components; mechanical; fasteners; riveting; self-tapping screws; crimping; nuts; bolts