

## Heat treating materials for marine fabrication activities

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### Overview

This standard identifies the competences you need to heat treat ferrous and non-ferrous materials, in order to assist with the marine fabrication activities, in accordance with approved procedures. You will be required to identify and use the appropriate materials, apply the appropriate processes and use tools and equipment based on the information presented to you, to achieve the required condition. The heat treatment processes will include hardening, tempering, annealing and normalising/stress relieving and can be applied to the fabricator's tools such as punches, chisels and scribes, or to the component/materials to be worked on.

Your responsibilities will require you to comply with organisational policy and procedures for the heat treatment activities undertaken and to report any problems with the heat treatment activities, equipment or materials used that you cannot personally 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 own 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 a sound approach to applying the heat treatment procedures required for marine fabrication activities. You will understand the principles of heat treatment and their application and will know about the effects on the structure of the materials and their characteristics, in sufficient depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the process is carried out to the required specification.

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:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. ensure the materials to be processed are suitably prepared for the processing operations to be carried out
3. check and monitor that the processing equipment is set up and maintained at satisfactory operating conditions throughout the processing operations
4. carry out the process in accordance with operating procedures and the workpiece specification requirements
5. ensure that the processed workpiece achieves the required characteristics and meets the processing specification
6. deal promptly and effectively with problems within your control and report those that you cannot solve
7. dispose of waste and excess materials in line with agreed organisational procedures
8. shut down the processing equipment to a safe condition on completion of the processing activities
9. complete relevant documentation in line with organisational procedures

## Knowledge and understanding

### You need to know and understand:

1. the specific safety precautions to be taken and safe working practices to be employed when carrying out the heat treatment of materials in a marine fabrication environment (including general workshop and site safety, appropriate personal protective equipment, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
2. the personal protective clothing and equipment (PPE) to be worn when working on heat treatment processes (such as face masks, aprons, gloves, eye/ear protection)
3. the handling precautions and correct methods of moving materials, particularly when hot
4. the hazards associated with carrying out heat treatment processes on fabrications (such as handling sheet/fabricated components, handling hot materials, overheating quenching oils, handling quenching oils) and how they can be minimised
5. reasons for heat treating materials
6. the various heat treatment processes, methods and procedures that may be applied
7. the type of equipment that can be used to carry out the various heat treatment processes (such as furnaces, blacksmith's hearth, gas torches)
8. handling techniques for hot metal components
9. how the materials need to be prepared in readiness for the heat treatment operations
10. the type of materials that can be heat treated and the processes that may be applied
11. materials and their characteristics and how their structure can be modified
12. the various cooling and quenching techniques that are applied to the processes and why it is important to use the correct process (including water, oil, sand, air)
13. the use of quenching oils and the need to maintain the oil temperature below the oil flashpoint
14. information sources on heat treatment temperatures, tempering colours, soak times required and quenching/cooling mediums to be used
15. the various testing techniques that can be used to check that the correct condition has been achieved (such as simple file or spark tests to check that hardening or annealing has been achieved)

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16. ways of limiting distortion during the heat treatment process
17. quality control procedures and recognition of defects
18. limitations of the various heat treatment processes
19. organisational procedures for disposing of and recycling of waste
20. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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### Scope/range related to performance criteria

1. Carry out all of the following during the heat treatment activities:
  1. use the correct heat treatment procedure and quality documentation
  2. follow relevant COSHH and risk assessment procedures
  3. apply the required heat treatment processes, safely and correctly
  4. ensure the safety of yourself and others while carrying out the processes
  5. leave the work area in a safe and tidy condition on completion of the activities
2. Carry out two of the following heat treatment processes/techniques:
  1. hardening
  2. tempering
  3. annealing
  4. pre-heating
  5. normalising/stress relieving
  6. carburising
  7. case hardening
  8. induction hardening
3. Apply the appropriate heat treatment process to two of the following:
  1. ferrous components/sections
  2. ferrous high carbon tools (punches, chisels, scribes)
  3. hot steel rivets
  4. non-ferrous sheet or plate
  5. titanium
4. Carry out heat treatment processes to the following quality and accuracy standards:
  1. tools are of the correct hardness for the application and where appropriate, suitably tempered
  2. hardened materials are free from cracks
  3. materials/components are suitably treated to permit working
  4. distortion is limited and controlled

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## 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

## Heat treating materials for marine fabrication activities

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	SEMME3161
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	Engineering; marine; heat treatment; fabrications; hardening; tempering; annealing; pre-heating; normalising; stress relieving