SEMAUT3073

Forming sheet and tube materials to fabricate motorsport components

Overview

This standard identifies the competences you need to form sheet and tubular components for motorsport vehicles, using hand tools and machine tools, in accordance with approved practices procedures. You will be required to select the appropriate equipment to use, based on the operations required, material to be formed, and the accuracy to be achieved, and this will include such items as hammers and stakes, formers, bending machines and rolling machines. The forming operations will include bends/upstands, folds, box sections, curved sections, square-to-round transformers, stretching and shrinking of materials.

Your responsibilities will require you to comply with organisational policy and procedures for the forming activities undertaken, and to report any problems with the tools and equipment, materials or activities that you cannot personally resolve, or that 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 an informed approach to applying forming procedures. You will understand the forming processes, the equipment used and its application, and will know about the materials and forming techniques, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and producing the components to the required specification.

You will understand the safety precautions required when working with the forming machines and their 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.

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 correct component drawing and any other related specifications for the component to be produced
3. ensure the appropriate tools and equipment for the pressure shaping operations are available and in a usable condition
4. shape the materials to the required specification using appropriate methods and techniques
5. check that all the required shaping operations have been completed to the required standard
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. ensure that work records are completed, stored securely and available to others, as per organisational requirements
8. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. how to obtain the necessary drawings, specifications and work instructions
6. how to extract and use information from engineering drawings and related specifications (to include symbols and conventions to current industry standards and codes of practice)
7. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
8. the marking-out conventions used in fabrication, and how to recognise cutting detail, bending and folding lines
9. the hand tools used in fabrication forming activities, and typical operations they are used for (a range of hammers, stakes, forming tools and sandbags)
10. the various machine-tool forming equipment that can be used to produce a range of shapes (bends, box sections, cylinders, curved sections and swages)
11. methods of stretching and shrinking materials, and the tools, equipment and techniques used
12. how to set up the various machines to produce the required forms (setting up of rolls; setting fingers on bending machines; setting forming tools for swaging)
13. ways of limiting distortion, marking, creases, flats (in curved sections)
14. how the materials are to be prepared for the forming operations, and why some materials may require a heating process prior to forming (annealing)
15. the characteristics and mechanical properties of the various materials used with regard to the bending and forming process
16. tool and equipment care and maintenance procedures
17. organisational quality control procedures, and recognition of pressure forming defects
18. dimensional and forming inspection checks to be carried out, and the tools and equipment to be used

19. limitations of the various forming processes and the accuracy that may realistically be achieved
20. methods of avoiding inaccuracies in forming activities
21. the problems that can occur with forming sheet and tube materials and how these can be avoided
22. the extent of your own authority and to whom you should report if you have problems that you cannot resolve
23. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Carry out all of the following during the fabrication activities:
    1. obtain and use the appropriate documentation (such as job instructions, component drawings, quality control documentation)
    2. adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
    3. hand tools are in a usable condition (such as hammer shafts secure; stakes, formers and striking faces free from defects and damage)
    4. the appropriate machine/equipment is selected for the operation being performed
    5. machine/equipment guards and safety devices are in position and function correctly
    6. forming tools are appropriate and in a serviceable condition (secure, correct shape, free from damage)
    7. equipment settings are suitable for the material thickness and operations to be performed
2. Form components to be used in one of the following types of motorsport vehicle:
    1. single seater
    2. kart
    3. motorcycle (such as circuit and off road)
    4. rallying
    5. historic
    6. sports car
    7. other specific approved competition vehicle
3. Use five of the following types of forming equipment:
    1. hammers/dollies/mallets
    2. brake/fly press
    3. stakes and formers

4. wheeling machine
5. bending machine (hand or powered)
6. jenny/wiring machine
7. rolling machine (hand or powered)
8. swaging machine
9. tube roller (aero tube)
10. box and pan folder
11. tube/pipe swaging equipment
12. shrinkers and stretchers

4. Produce six of the following motorsport vehicle components using forming equipment:

    1. wishbones
    2. swirl pots
    3. heat exchangers
    4. uprights
    5. panels
    6. pedals
    7. water or oil coolers
    8. wings/bodywork
    9. brackets
    10. roll cages
    11. space frames
    12. radiator tanks
    13. header tanks
    14. other specific components

5. Produce components made from two different materials from the following:

    1. mild-steel
    2. inconel alloys
    3. copper
    4. stainless steel
    5. aluminium
    6. lead
    7. titanium
    8. brass
    9. other specific material

6. Check components meet all of the following quality and accuracy standards:

1. dimensional accuracy is within specification tolerances
2. finished components meet the required shape
3. completed components are free from excessive tooling marks, deformation or cracking

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