

SEMFWE3-37 – SQA Unit Code H1W3 04

Producing and finishing holes using drilling machines



Overview

This standard identifies the competencies you need to produce holes using drilling machines in sheet, plate, rolled section or pipe in accordance with approved procedures. You will be required to select the appropriate drilling equipment to use based on the operations to be performed and the size of the component worked on. You will be expected to use appropriate workholding methods and techniques to secure the workpiece for the drilling operations and this will include the use of jigs, clamps, machine vice and other appropriate holding devices. In drilling the holes you will need to accurately position the drill bits and use appropriate speeds and feeds to drill and finish the holes to the required specification. Drilling and finishing operations will include through holes, blind holes, counter-bored holes, countersunk holes, spot facing, reaming and tapping.

Your responsibilities will require you to comply with organisational policy and procedures for the drilling activities undertaken and to report any problems with the equipment or drilling activities that you cannot personally 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 own 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 applying the drilling and finishing procedures. You will understand the drilling equipment used and its application, together with the material characteristics and the appropriate tooling for carrying out the drilling and finishing process. You will know about the basic principles and requirements of securing the work piece prior to carrying out the process in adequate depth to provide a sound basis for carrying out the drilling activities, correcting faults and ensuring the work output meets the required specification. You will understand the safety precautions required when carrying out the drilling and finishing activities. You will be required to demonstrate safe working practices throughout, and will understand the responsibility 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 confirm that the machine is set up and ready for the machining activities to be carried out
 - P3 manipulate the machine tool controls safely and correctly in line with operational procedures
 - P4 produce components to the required quality and within the specified dimensional accuracy
 - P5 carry out quality sampling checks at suitable intervals
 - P6 deal promptly and effectively with problems within your control and report those that cannot be solved
 - P7 shut down the equipment to a safe condition on conclusion of the machining activities

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Knowledge and understanding

You need to know and understand:

- K1 the specific safety precautions to be taken when working in a fabrication environment and when carrying out drilling and finishing operations on materials used in fabricating (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 fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
- K3 the correct methods of moving or lifting materials
- K4 the safe working practices and procedures to be used when using portable power operated tools and drilling machines, including emergency stop procedures for the machines
- K5 the hazards associated with drilling work and how they can be minimised (such as using dangerous or badly maintained tools and equipment; insecure or poorly clamped workpieces; airborne metal particles; sharp edges and splinters)
- K6 how to obtain the necessary drawings, specifications and work instructions
- K7 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)
- K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K9 how to interpret marking out conventions (such as cutting lines; centre lines)
- K10 the various types and application of drilling machines (including portable power tools, bench and pedestal machines and radial arm machines)
- K11 the range of drilling and hole finishing tools available (including twist drills, reamers, counter-bore tools, countersink tools, spot facing tools, taps) and how to check their serviceability
- K12 the methods of holding and securing the drills and finishing tools into the machine spindle (chucks, taper shank sleeves, collet chucks)
- K13 the methods of holding and securing workpieces for drilling (including jigs and fixtures, machine vices, clamps and restraining devices)
- K14 methods used to align the drill with the workpiece and the use of centre drills and pilot drills
- K15 how to check that the drill hole is in the correct position before drilling to the full diameter, and how to correct a drill that has been started off

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- centre
- K16 the selection of speeds and feeds for drilling, reaming and finishing operations
 - K17 the selection of cutting fluids and compounds for drilling, reaming and tapping of holes
 - K18 setting and adjusting tools and equipment such as the use of depth stops
 - K19 the material characteristics and process considerations that need to be taken into account when carrying out drilling operations
 - K20 the care and control of tools and equipment; checking portable power tool leads, plugs and sockets are in a safe and usable condition
 - K21 the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations
 - K22 the problems that can occur with drilling operations, and how these can be avoided
 - K23 inspection techniques that can be applied to check the dimensional accuracy and finish is to specification and within acceptable limits
 - K24 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
 - K25 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. ensure that the equipment is fit for purpose and used safely by carrying out **all** of the following:
 - 1.1 selecting the appropriate drilling equipment/machine for the operation being performed
 - 1.2 checking the machine guards and safety devices are in position and function correctly
 - 1.3 checking drill bits and cutting tools are in a serviceable condition (free from damage or chips; sharp)
 - 1.4 isolating the equipment from its power supply whilst changing drill bits
 - 1.5 securely clamping/restraining the components during the drilling operations
 - 1.6 using the equipment safely and correctly and only for its intended purpose
 2. use **two** of the following drilling machines:
 - 2.1 hand held drilling machine
 - 2.2 pillar/bench drill
 - 2.3 radial arm drill
 - 2.4 other types of clamped drills (such as magnetic, vacuum)
 3. use **two** of the following workholding devices:
 - 3.1 jigs/fixtures
 - 3.2 machine vice
 - 3.3 clamps
 - 3.4 other types of clamps (such as magnetic, vacuum)
 4. carry out **five** of the following drilling and finishing operations:
 - 4.1 drilling through holes
 - 4.2 centre drilling
 - 4.3 drilling holes to a depth
 - 4.4 spot facing
 - 4.5 counter-boring holes
 - 4.6 trepanning holes
 - 4.7 countersinking holes
 - 4.8 tapping holes
 - 4.9 reaming holes
 - 4.10 jig or template drilling
 - 4.11 tapered reaming
 - 4.12 component alignment drilling
 5. produce drilled and finished components which meet **all** of the following

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- quality and accuracy standards as is applicable to the process:
 - 5.1 dimensional and positional accuracy is within specification tolerances
 - 5.2 drilled holes are correctly formed and free from excessive tool marks
 - 5.3 reamed holes are of the correct fit and have a smooth surface finish free from tool marks
 - 5.4 tapped holes are of the correct type, threads are correctly formed and have a good fit
 - 5.5 counter-bores, countersinks and spot facings meet job requirements
- 6. produce drilled holes in **three** of the following material types:
 - 6.1 ferrous sheet metal
 - 6.2 stainless steel plate or components
 - 6.3 stainless steel sheet metal
 - 6.4 non-ferrous plate or components
 - 6.5 non-ferrous sheet metal
 - 6.6 non-metallic materials
 - 6.7 ferrous plate or components
 - 6.8 composite materials

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Developed by SEMTA

Version number 2

Date approved December 2011

Indicative review date December 2016

Validity Current

Status Original

Originating organisation SEMTA

Original URN 37

Relevant occupations Engineering and manufacturing technologies; engineering; Metal Forming, Welding and Related Trades

Suite Fabrication and Welding Engineering Suite 3

Key words engineering; welding; fabrication; machining; finishing; drilling holes; manual drilling; pillar drills; bench drill; radial arm drill