

Unit 3: Developing Skills in Using a Bench/Pedestal Drilling Machine

Unit reference number: H/600/9139

QCF level: 1

Credit value: 4

Guided learning hours: 40

Unit aim

This unit will enable learners to develop the skills needed to produce holes with positional and dimensional accuracy in basic engineering components, using marking out equipment and a bench/pedestal drilling machine. This unit provides some of the knowledge, understanding and skills for the Level 1 Performing Engineering Operations NOS Unit 4: Making Components using Hand Tools and Fitting Techniques.

Unit introduction

In this unit learners will be introduced to the practical skills needed to carry out drilling operations using a bench or pedestal drilling machine. They will explore the need to understanding what they are going to carry out and prepare the machine, tools and holding devices correctly. Learners will then drill holes to given specifications and check for size and positional accuracy using rules, calipers and other measuring equipment which they have selected.

Learners will consider the importance of working safely with powered machinery and the need to check that guards, isolation switches, tools and equipment are in a safe and useable condition at all times. They will also appreciate that before they start to drill a component they must check that it is suitable for holding down and is made from the correct material.

This unit helps learners to appreciate the importance of following given instructions when carrying out activities and recognise what might go wrong when drilling holes in basic engineering components.

Essential resources

It would be extremely useful if learners had access to a range of equipment commonly used in engineering. It may be possible to arrange a visit to an engineering company to extend learner awareness of the range of resources used in engineering.

A typical centre engineering workshop should be equipped with the basic requirements of this unit including marking out equipment, hand tools, measuring equipment and bench/pillar drilling machines. All supporting auxiliary equipment should also be available together with appropriate safety equipment.

Workshops should be staffed appropriately to ensure health and safety requirements are met. Technician support may be required during practical work.

Information for tutors

Delivery

This unit is essentially practical and learners will benefit from practising their skills before being assessed. Learners should think about the drilling operations to be carried out and actions to be taken to prepare their workplace. Learners should have opportunities to talk about what they are going to do and how they propose to overcome any problems when using a drilling machine. It is important that learners understand the hazards involved when working with powered machinery and the measures which must be taken in order to minimise risk. They should also be fully aware of what to do in the case of an emergency.

At this level it is not appropriate for learners to work with complicated components.

Outline learning plan

The outline learning plan has been included in this unit as guidance.

Topic and suggested assignments/activities

Confirm with a supervisor what has to be done before drilling activities are carried out safely in a work area.

Tutor-led unit introduction covering content, method of working and assessment.

Tutor-led overview of the drilling skills learners will develop.

Whole-class, tutor-led discussion about the steps involved when using a bench/pedestal drill to make holes in materials.

Tutor-led discussion about PPE, where and when it is necessary and how it works.

Tutor-led discussion about the need to confirm proposed activities with a supervisor.

Small-group activity to plan how to drill different types of hole.

Prepare a work area ready for drilling activities to be carried out.

Whole-class, tutor-led discussion about the need to prepare work areas – present exemplars of good and bad preparation.

Paired activity to identify hazards/bad practices when working with drilling machines – presented as images with a checklist to complete.

Tutor-led discussion about the emergency procedures that apply to rotating machinery.

Check that machinery and tools are safe to use.

Whole-class, tutor-led discussion about why machinery and tools should be checked before being used. Tutor presents a small range of examples which show the consequences of working with machinery and tools that are not fit for purpose.

Small-group activity to identify the risks involved when drilling holes and the measures which should be taken to reduce these risks.

Topic and suggested assignments/activities

Set up a bench/pedestal drilling machine which can be used to carry out drilling activities.

Tutor-led demonstration of setting up and using a bench/pedestal drilling machine.

Paired activity setting up a bench/pedestal drilling machine – selecting tools and holding device, selecting and adjusting spindle speed, adjusting table height, fitting chucks and tapers.

Use a bench/pedestal drilling machine to carry out drilling activities safely to a required specification.

Paired and individual activities to develop skills when working with a bench/pedestal drilling machine – positioning drill bits, trial cuts, checking accuracy, different types of hole, application of lubricants.

Paired activity – machine isolation and clean down.

Check that drilled holes are to the required standard.

Whole-class, tutor-led discussion about why machined features should be checked against the specification.

Paired activity to check the positional accuracy and diameters of drilled/reamed holes.

Assessment activity – prepare a work area and carry out drilling activities using a bench/pedestal drilling machine.

Individual activity to drill holes and carry out inspection checks which address the unit content and six assessment criteria.

Seek and respond to guidance from the tutor.

Tutors should encourage learners to have a dialogue with them. This could be prompted by the tutor asking learners to explain what they are doing, why they are doing it and how they are able to work safely. This does not require a formal allocation of time and should occur during delivery and assessment of the unit.

Assessment

Learners will benefit from access to a range of assessment opportunities. Examples might include observed practice, recorded explanations, checklists and annotated photographic records. Entries within a logbook and an inspection record for each drilling operation, validated by the tutor, are also appropriate methods for recording achievement. Competence when carrying out practical activities should be evidenced through witness testimonies or observation records signed by the tutor.

Learning outcomes, assessment criteria and unit amplification

To pass this unit, the learner needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

Learning outcomes	Assessment criteria		Unit amplification
1 Be able to prepare a work area for producing components using a bench/pedestal drilling machine	1.1	Confirm with a supervisor what has to be done before drilling activities are carried out safely in a work area	<ul style="list-style-type: none"> □ <i>Before starting work:</i> understand the task eg what needs to be carried out, order of operations, tools and equipment, quality checks; personal protection eg eye protection, hair protection, removal of loose clothing and jewellery, footwear, use of barrier cream; regulations and safety procedures; maintenance of access eg clear walkways, emergency exits; the need for good housekeeping eg cleanliness of work area, removal of waste materials; what might go wrong eg damaged materials, tool breakage, finished holes not to standard; confirm proposed actions with a supervisor
	1.2	Prepare a work area ready for drilling activities to be carried out	<ul style="list-style-type: none"> □ <i>Work area preparation:</i> single spindle bench/pedestal drilling machine; obtain components to be drilled; select tools and equipment eg marking out fluid, rule, square, centre punch, hammer, depth and plug gauges, chuck, taper sleeve, drill bits, reamers, lubricant; obtain correct personal protective equipment eg eye protection, hair protection, overalls, safety footwear; identify procedure for machine start/stop in both normal and emergency situations
	1.3	Check that machinery and tools are safe to use	<ul style="list-style-type: none"> □ <i>Check that machinery and tools are safe to use:</i> condition of machine eg guards, isolator switch, start/stop switch, emergency stop switch, limit switch, cutting lubricants, drill chuck, spindle taper sleeves, table; condition of cutting tools eg sharpness, tip angle, shank straightness, surface condition of shank; condition of holding devices eg hand vice, machine vice, angle brackets, clamps

Learning outcomes	Assessment criteria		Unit amplification
<p>2 Be able to safely carry out drilling activities using a bench/pedestal drilling machine.</p>	2.1	Set up a bench/pedestal drilling machine which can be used to carry out drilling activities	<ul style="list-style-type: none"> □ Set up a <i>bench/pedestal drilling machine</i>: machine isolation before mounting cutting tools or work handling devices; adjustment of table height and position; mounting work piece eg hand vice, machine vice, angle brackets, clamping to machine table; mounting and securing of tools eg chuck, taper sleeve, centre drill, twist drill, pilot drill, reamer, counterbore tool, countersinking tool; drill shanks eg straight, Morse taper; machine settings and adjustments eg spindle speed, feed rate, guards, safety devices; cutting lubricants eg fluids, compounds
	2.2	Use a bench/pedestal drilling machine to safely carry out drilling activities to a required specification	<ul style="list-style-type: none"> □ Use a <i>bench/pedestal drilling machine</i>: techniques of positioning drills to marking out eg use of centre drills, boxed holes, taking trial cuts, checking accuracy; drilling techniques eg through holes, holes with a given depth, flat bottomed holes, counterbores, countersinks, reamed holes, correcting holes which are off-centre; drill feeding eg manual, power; applying cutting lubricants eg pressure fed, by brush; good housekeeping eg machine isolation, cleaning down, return of tools and equipment into safe storage
	2.3	Check that drilled holes are to the required standard.	<ul style="list-style-type: none"> □ Use a <i>bench/pedestal drilling machine</i>: techniques of positioning drills to marking out eg use of centre drills, boxed holes, taking trial cuts, checking accuracy; drilling techniques eg through holes, holes with a given depth, flat bottomed holes, counterbores, countersinks, reamed holes, correcting holes which are off-centre; drill feeding eg manual, power; applying cutting lubricants eg pressure fed, by brush; good housekeeping eg machine isolation, cleaning down, return of tools and equipment into safe storage

Suggested resources

Books

Boyce et al – *Engineering Level 1 Foundation Diploma* (Edexcel/Pearson, 2008)
ISBN 9780435756253

Chapman et al – *GNVQ Intermediate Engineering* (Longman, 2000)
ISBN 9780582381384

Darbyshire et al – *GNVQ Intermediate Engineering* (Nelson Thornes, 1997)
ISBN 9780748729364

Timings R L – *Basic Manufacturing* (Newnes, 1998) ISBN 9780750659901

Timings R L – *Manufacturing Technology Volume One* (Longman, 1998)
ISBN 9780582356931

Tooley M – *Engineering GNVQ Intermediate* (Butterworth-Heinemann, 1996)
ISBN 9780750625975

Waters F – *Fundamentals of Manufacturing for Engineers* (UCL Press, 1996)
ISBN 9781857283389

Tutor resource disks

Boyce et al – *Engineering Level 1 Foundation Diploma* (Edexcel/Pearson, 2008)
ISBN 9780435756260

Websites

www.hse.gov.uk