

# Draft National Unit Specification



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**Unit title:** Practical Metalworking: Fabrication and Thermal Joining Techniques (National 5)

**SCQF:** level 5 (6 SCQF credit points)

**Unit code:** to be advised

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## Unit outline

The general aim of this Unit is to help learners develop skills in fabrication, forming and joining of simple metalwork components. Learners will develop skills in thermal joining techniques. They will build skills in measuring and marking-out. Learners will also develop an appreciation of safe working practices in a workshop environment.

Learners who complete this Unit will be able to:

- 1 Prepare for metalwork fabrication and joining tasks
- 2 Apply fabrication techniques to form and bend metal
- 3 Apply joining techniques to join metal
- 4 Manufacture a metalwork artefact from working drawings using fabrication and joining techniques

This Unit is a mandatory Unit of the Practical Metalworking (National 5) Course and is also available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes*, which provides advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in the *National Assessment Resource*.

## Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- ◆ Practical Metalworking (National 4) Course or relevant component Units

In terms of prior learning and experience, relevant experiences and outcomes may also provide an appropriate basis for doing this Unit. Further information on relevant experiences and outcomes will be given in the *Unit Support Notes*.

## **Equality and inclusion**

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information please refer to the *Unit Support Notes*.

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# Standards

## Outcomes and assessment standards

### Outcome 1

The learner will:

#### 1 Prepare for metalwork fabrication and joining tasks by:

- 1.1 Selecting metalworking materials and fixings appropriate for a minimum of six fabrication and joining tasks, identifying them based on their properties and uses
- 1.2 Selecting a minimum of ten items of metalworking tools and equipment appropriate for the fabrication and joining of metals
- 1.3 Confirming that metalworking tools and equipment are in good condition and safe working order before, during and after use
- 1.4 Adjusting tools where necessary, following safe working practices
- 1.5 Using correct names and terminology when referring to common metalworking tools, equipment, materials and processes
- 1.6 Working in accordance with recognised procedures and safe working practices
- 1.7 Explaining good practice in terms of sustainability for practical metalworking tasks
- 1.8 Describing a minimum of three industrial processes relating to fabrication and joining of metalwork

### Outcome 2

The learner will:

#### 2 Apply fabrication techniques to form and bend metal by:

- 2.1 Selecting the correct tools and equipment for the work being undertaken
- 2.2 Using tools and equipment safely and correctly
- 2.3 Selecting appropriate metals in the form of sections and sheet materials to demonstrate fabrication techniques
- 2.4 Using forming techniques of twisting, drawing down and flattening and to a tolerance of +/- 3 mm
- 2.5 Using bending techniques on metal bar and metal strip (including on edge) and to a tolerance of +/- 5 mm
- 2.6 Working in accordance with recognised procedures and safe working practices
- 2.7 Carrying out good practice in terms of sustainability and recycling

### Outcome 3

The learner will:

#### 3 Apply techniques to join metal by:

- 3.1 Selecting the correct tools and equipment for the work being undertaken
- 3.2 Using tools and equipment safely and correctly
- 3.3 Selecting appropriate metals in the form of sections and sheet materials to demonstrate joining techniques
- 3.4 Carrying out welding, brazing or soldering operations and consistent in width and form and in several short runs, each to a minimum length of 50 mm

- 3.5 Carrying out spot welding operations consistent in quality and to form neat and effective joints
- 3.6 Carrying out a minimum of four mechanical fixings of metal sections and/or sheet materials such that connections are secure and without damage in torque and tightening, including pilot holes as required and to a tolerance of +/- 0.5 mm in marking out
- 3.7 Carrying out the fixing of metal sections and/or sheet materials with proprietary metalwork adhesives such that fixing is secure, neat, free of excess materials and accurate to within +/- 0.5 mm of marking out; minimum length of fixing to be 150 mm
- 3.8 Working in accordance with recognised procedures and safe working practices
- 3.9 Carrying out good practice in terms of sustainability and recycling

## **Outcome 4**

The learner will:

- 4 Manufacture a metalwork artefact with a minimum of three component parts from working drawings using fabrication and joining techniques by:**
  - 4.1 Planning and organising metalworking tasks in terms of tools, equipment and materials requirements
  - 4.2 Checking materials requirements against working drawings
  - 4.3 Selecting appropriate metals in the form of sections and sheet materials to manufacture the artefact
  - 4.4 Correctly locating datum and marking out components
  - 4.5 Selecting and using the correct tools and equipment for the work being undertaken safely and correctly
  - 4.6 Within the manufacture of the artefact, using at least one forming technique from twisting, drawing down and flattening and to a tolerance of +/- 3 mm
  - 4.7 Within the manufacture of the artefact, using bending techniques on metal bar or metal strip (including on edge) and to a tolerance of +/- 5 mm
  - 4.8 Within the manufacture of the artefact, using welding, brazing or soldering operations to form neat and effective joints and with consistency in width
  - 4.9 Within the manufacture of the artefact, using a number of mechanical fixings of metal sections and/or sheet materials such that connections are secure and without damage in torque and tightening, including pilot holes as required and to a tolerance of +/- 0.5 mm in marking out
  - 4.10 Within the manufacture of the artefact, using the fixing of metal sections and/or sheet materials with proprietary metalwork adhesive such that fixing is secure, neat, free of excess materials and accurate to within +/- 0.5 mm of marking out
  - 4.11 Using tools and equipment safely and in accordance with good practice
  - 4.12 Working in accordance with recognised procedures and safe working practices
  - 4.13 Carrying out good practice in terms of sustainability and recycling

## Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

Evidence may be presented for individual Outcomes or it may be gathered for the Unit as a whole through integrating assessment holistically in one single activity. If the latter approach is used, it must be clear how the evidence covers each Outcome

For this Unit, learners will be required to provide evidence of:

- ◆ knowledge and understanding of a range of fabrication and joining techniques, materials, tools and equipment
- ◆ the ability to produce simple artefacts using fabrication and joining techniques to a given standard
- ◆ working in accordance with given procedures and safe working practices

The use of jigs is permitted in fabrication work. Note must be taken of when jigs are used and also when jigs are made by learners themselves.

The joining techniques applicable to this Unit include thermal joining techniques, mechanical joining techniques and the use of adhesives.

Permitted thermal joining techniques come under the three headings of: welding, brazing, and soldering. There are several distinct techniques to be found under each of these headings. Evidence Requirements for this Unit do not preclude any particular thermal joining technique. However, it is acknowledged that, in practice, the range of thermal joining equipment available in educational workshops is likely to be limited.

Mechanical joining techniques that may be used in this Unit include riveting, bolting, screw fixing and the use of proprietary metalwork fixings.

Adhesives used in joining metal sections and sheet workpieces must be of a proprietary metalworking variety.

The metalwork artefact from Outcome 4 must comprise a minimum of three component parts.

The tolerances given in the Assessment Standards for metalwork components and artefacts are indicative of the typical standard expected at National 5 level for Practical Metalworking Units. Tolerances for assemblies in this context are dependent on the size and scale of the assemblies selected. It is assumed that assemblies in this Unit are readily portable and that the tolerances given are suitable for such work and at this level. The tolerances are also given assuming that available machinery can reasonably meet these expectations.

Exemplification of assessment for this Unit is provided in the *National Assessment Resource*. Advice and guidance on possible approaches to assessment is provided in the *Unit Support Notes*.

## Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Unit. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Unit where there are appropriate opportunities.

### **1 Literacy**

1.3 Listening and talking

### **2 Numeracy**

2.2 Money, time and measurement

### **4 Employability, enterprise and citizenship**

4.3 Working with others

### **5 Thinking skills**

5.3 Applying

5.5 Creating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills should be at the same SCQF level of the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the *Unit Support Notes*.

## Administrative information



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**Published:** August 2011 (version 1.0)

**Superclass:** to be advised

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### History of changes

Version	Description of change	Authorised by	Date

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