

Level 1 Awards and Certificates in Introductory Welding, Fabrication, Cutting and Brazing and Soldering Skills (3268)

September 2017 Version 3.1



Qualification at a glance

Subject area	Welding
City & Guilds number	3268
Age group approved	Pre-16, 16-18, 19+
Entry requirements	None
Assessment	Portfolio/assignment
Fast track	Not available
Support materials	Centre handbook, Practical assessment handbooks
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 1 Award in Introductory Manual Metal Arc (MMA) Welding	3268-10	600/3748/9
Level 1 Award in Introductory Oxy-Acetylene Welding	3268-11	600/3753/2
Level 1 Award in Introductory Tungsten Inert Gas (TIG) Welding	3268-12	600/3754/4
Level 1 Award in Introductory Metal Inert Gas (MIG) Welding	3268-13	600/3749/0
Level 1 Award in Introductory Brazing and Soldering	3268-14	601/4166/9
Level 1 Award in Introductory Metal Fabrication	3268-15	601/4167/0
Level 1 Award in Introductory Thermal Cutting Techniques	3268-16	601/4169/4
Level 1 Certificate in Introductory Welding Skills	3268-17	601/4170/0
Level 1 Certificate in Introductory Welding, Fabrication and Cutting Skills	3268-18	601/4168/2

Version and date	Change detail	Section
3.1 September 2017	Added TQT details Deleted QCF	Qualification at a glance and Structure Throughout
3.0 October 2014	Handbook updated and new units added	All



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1 Introduction

This document tells you what you need to do to deliver these qualifications:

Area	Description
Who are the qualifications for?	The qualifications at Level 1 are designed for those wishing to enter the industry and for those wanting to gain a welding, metal fabrication, thermal cutting or brazing and soldering qualification for their own personal skills development
What do the qualifications cover?	They allow candidates to learn, develop and practise the skills required for employment and/or career progression in the engineering sector.
What opportunities for progression are there?	<p>The qualifications provide knowledge and/or practical skills related to the Level 1 NVQ Certificate in Performing Engineering Operations</p> <p>On completion of these qualifications candidates may progress into employment or to the following City & Guilds qualifications:</p> <ul style="list-style-type: none">• Level 2 Award in Welding Skills (3268-02)• Level 2 Award in Thermal Cutting Techniques (3268-22)• Level 2 Award in Metal Fabrication (3268-23)• Level 2 Certificate in Welding, Fabrication and Cutting Skills (3268-25)• Level 2 Diploma in Engineering (2850)

Structure

Awards

To achieve the **Level 1 Award in Introductory Manual Metal Arc (MMA) Welding (3268-10)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
H/501/9417	101	Manual Metal Arc Welding	7

To achieve the **Level 1 Award in Introductory Oxy-Acetylene Welding (3268-11)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
K/501/9418	102	Oxy-Acetylene Welding	7

To achieve the **Level 1 Award in Introductory Tungsten Inert Gas (TIG) Welding (3268-12)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
M/501/9419	103	Tungsten Inert Gas Welding	7

To achieve the **Level 1 Award in Introductory Metal Inert Gas (MIG) Welding (3268-13)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
H/501/9420	104	Metal Inert Gas Welding	7

To achieve the **Level 1 Award in Introductory Brazing and Soldering (3268-14)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
R/506/6250	105	Brazing and Soldering	7

To achieve the **Level 1 Award in Introductory Metal Fabrication (3268-15)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Y/506/6251	106	Metal Fabrication	7

To achieve the **Level 1 Award in Introductory Thermal Cutting Techniques (3268-16)**, learners must achieve **7** credits from the mandatory unit.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
H/506/6253	107	Thermal Cutting Techniques	7

Certificates

To achieve the **Level 1 Certificate in Introductory Welding Skills (3268-17)**, learners must achieve **14** credits from the optional units (101-104).

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
H/501/9417	101	Manual Metal Arc Welding	7
K/501/9418	102	Oxy-Acetylene Welding	7
M/501/9419	103	Tungsten Inert Gas Welding	7

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
H/501/9420	104	Metal Inert Gas Welding	7

To achieve the **Level 1 Certificate in Introductory Welding, Fabrication and Cutting Skills (3268-18)**, learners must achieve **21** credits. **14** credits from the mandatory units (106 and 107) and **7** credits from the optional units (101-104).

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
Y/506/6251	106	Metal Fabrication	7
H/506/6253	107	Thermal Cutting Techniques	7
Optional			
H/501/9417	101	Manual Metal Arc Welding	7
K/501/9418	102	Oxy-Acetylene Welding	7
M/501/9419	103	Tungsten Inert Gas Welding	7
H/501/9420	104	Metal Inert Gas Welding	7

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 1 Award in Introductory Manual Metal Arc (MMA) Welding	60	70
Level 1 Award in Introductory Oxy-Acetylene Welding	60	70
Level 1 Award in Introductory Tungsten Inert Gas (TIG) Welding	60	70
Level 1 Award in Introductory Metal Inert Gas (MIG) Welding	60	70
Level 1 Certificate in Introductory Welding Skills	120	140
Level 1 Certificate in Introductory Welding, Fabrication and Cutting Skills	145	210



2 Centre requirements

Approval

To offer any of these qualifications, new centres will need to gain both centre and qualification approval. Please refer to the *Centre guide* and *Providing City & Guilds Qualifications* for further information.

Existing centres already offering 3268-(10-13) will be given automatic approval for 3268-17. They will still need to gain qualification approval for 3268-14, 15, 16 and 18.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Resource requirements

Physical resources

Centres must provide access to sufficient equipment in the centre or workplace to ensure candidates have the opportunity to cover all of the practical activities.

Centre staffing

Centre staff must satisfy the requirements for occupational expertise for this qualification.

These requirements are as follows:

Staff should be technically competent in the areas for which they are delivering training and/or should also have experience of providing training.

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the areas for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Assessors and internal verifiers

While the Assessor/Verifier (A/V) units are valued as qualifications for centre staff, they are not currently a requirement for these qualifications.

Continuing professional development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.

Candidate entry requirements

Candidates should not be entered for a qualification of the same type, content and level as that of a qualification they already hold.

There are no formal entry requirements for candidates undertaking these qualifications. However, centres must ensure that candidates have the potential and opportunity to successfully gain the qualification.

Age restrictions

These qualifications are not approved for use by candidates under the age of 14, and City & Guilds cannot accept any registrations for candidates in this age group.



3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualification
- any units they have already completed, or credit they have accumulated which is relevant to the qualification
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, **Learning Assistant**, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: www.cityandguilds.com/eportfolios.

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate. *Recording forms* are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the External Verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.



4 Assessment

Assessment of the qualification

For each qualification candidates will be required to complete the following assessments:

- **Five** practical assignments and one oral knowledge test for each **welding** unit.
- **Four** practical assignments and one oral knowledge test for the **brazing and soldering** unit.
- **Three** practical assignments and one oral knowledge test for the **metal fabrication** unit.
- **Three** practical assignments and one oral knowledge test for the **thermal cutting** unit.

Full assignment details can be found in the Practical Assessment Handbooks which are available on the City & Guilds website.

Time constraints

Recommended time allowances have been allocated for each assessment, however, this does not form part of the marking criteria and is for guidance purposes only.

Should Assessors find that the recommended time for an assignment is considerably at a variance with the time taken by candidates, they should contact their External Verifier in the first instance, who will advise accordingly and feed this information back to City & Guilds where appropriate.

Opportunities to repeat tasks within an assignment

If a candidate fails a task, they may repeat it. Assessors, however, should allow **seven** days before a candidate repeats a task.

If the failed task is built upon the results of a previous task, this may also need to be repeated.

Grading and marking

Grading of assignments for these qualifications is pass or fail.

Grading is based on essential and desirable criteria for each task. Each marking criterion should be marked with a 'P' to indicate achievement and a cross 'X' if it has not been achieved. In the event that a marking criterion is not applicable, it should be crossed through and marked 'not appropriate' and a note made of the reason(s) why. Candidates must achieve all essential and a prescribed number of desirable criteria for the award of a Pass.

Detailed marking and grading criteria are provided in the Practical Assessment Handbook.

Assignments are internally marked and graded Pass/Fail.

Simulation is not permitted for the assessment of these qualifications.

The Practical Assessment Handbooks for these qualifications contain an 'Evidence Recording Sheet'.

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate. **Recording forms** are available on the City & Guilds website.

Although it is expected that new centres will use these forms, centres may devise or customise alternative forms, which must be approved for use by the External Verifier, before they are used by candidates and assessors at the centre.

Amendable (MS Word) versions of the forms are available on the City & Guilds website.

Individual Practical Assessment Handbooks have been produced for each unit available at Level 1. These can be found on the City & Guilds website.



5 Units

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

UAN:	H/501/9417
Level:	1
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Using manual metal arc welding equipment.
Aim:	The unit is designed to enable candidates to demonstrate welding skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete welded joints in simple welding positions and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will: 1. produce beads on plate in the PA flat position
Assessment criteria
The learner can: 1.1 use manual metal arc welding techniques safely to produce beads on a plate in simple welding positions 1.2 check joints are aligned and welds are sound and of uniform appearance 1.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 2. produce a lap fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 2.1 use manual metal arc welding techniques safely to produce a lap fillet weld in simple welding positions 2.2 check joints are aligned and welds are sound and of uniform appearance 2.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

3. produce a tee fillet weld in the PA flat position

Assessment criteria

The learner can:

- 3.1 use manual metal arc welding techniques safely to produce a tee fillet weld in simple welding positions
- 3.2 check joints are aligned and welds are sound and of uniform appearance
- 3.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

4. produce a tee fillet weld in the PB horizontal/vertical position

Assessment criteria

The learner can:

- 4.1 use manual metal arc welding techniques safely to produce a tee fillet weld in simple welding positions
- 4.2 check joints are aligned and welds are sound and of uniform appearance
- 4.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

5. produce a corner weld in the PA flat position

Assessment criteria

The learner can:

- 5.1 use manual metal arc welding techniques safely to produce a corner weld in simple welding positions
- 5.2 check joints are aligned and welds are sound and of uniform appearance
- 5.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

6. know the process and health & safety requirements for manual metal arc (MMA) welding

Assessment criteria

The learner can:

- 6.1 identify the health and safety hazards associated with MMA welding
- 6.2 state the effects of exposure to the electric arc
- 6.3 indicate types of fire extinguisher
- 6.4 state the effects of exposure to welding fume
- 6.5 identify the personal protective equipment (PPE) and clothing to be worn during MMA welding
- 6.6 identify the welding specific requirements for MMA welding
 - identify main components and controls
 - electrical connections
 - type of current
- 6.7 identify the consumables used for MMA welding
 - types of electrode
 - function of covering
 - storage and handling conditions
- 6.8 identify the quality specific requirements for MMA welding
 - defects associated with the process
 - types of joint configurations
 - the factors that affect weld quality
 - post-welding activities

UAN:	K/501/9418
Level:	1
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Using manual oxy-fuel gas welding equipment.
Aim:	The unit is designed to enable candidates to demonstrate welding skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete welded joints in simple welding positions and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will:
1. produce beads on plate in the PA flat position
Assessment criteria
The learner can:
1.1 use oxy-acetylene welding techniques safely to produce beads on a plate in simple welding positions
1.2 check joints are aligned and welds are sound and of uniform appearance
1.3 identify defects in the weld using visual checks

Learning outcome
The learner will:
2. produce a lap fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can:
2.1 use oxy-acetylene welding techniques safely to produce a lap fillet weld in simple welding positions
2.2 check joints are aligned and welds are sound and of uniform appearance
2.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 3. produce a brazed tee fillet joint in the PA flat position
Assessment criteria
The learner can: 3.1 use oxy-acetylene welding techniques safely to produce a brazed tee fillet joint in simple welding positions 3.2 check joints are aligned and welds are sound and of uniform appearance 3.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 4. produce a brazed tee fillet joint in the PB horizontal/vertical position
Assessment criteria
The learner can: 4.1 use oxy-acetylene welding techniques safely to produce a brazed tee fillet joint in simple welding positions 4.2 check joints are aligned and welds are sound and of uniform appearance 4.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 5. produce a corner weld in the PA flat position
Assessment criteria
The learner can: 5.1 use oxy-acetylene welding techniques safely to produce a corner weld in simple welding positions 5.2 check joints are aligned and welds are sound and of uniform appearance 5.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

6. know the process and health & safety requirements for manual oxy-acetylene welding

Assessment criteria

The learner can:

- 6.1 identify the health and safety hazards associated with oxy-acetylene welding
 - hazards
 - precautions
- 6.2 indicate types of fire extinguisher
 - colour
 - type
 - applications
- 6.3 identify types of safety signs
 - prohibition
 - warning
 - mandatory
 - emergency
- 6.4 identify the personal protective equipment (PPE) and clothing to be worn during oxy-acetylene welding
- 6.5 identify the welding specific requirements for oxy-acetylene welding
- 6.6 state the gas connections in an oxy-acetylene welding system
- 6.7 state the influence the selection of nozzle size
- 6.8 state the factors that influence the selection of size of filler rod
- 6.9 state the correct storage conditions for filler rods
- 6.10 state the function of flux
- 6.11 identify types of joint configurations
- 6.12 state the defects associated with the process
 - methods of cleaning
 - means of avoiding
- 6.13 state the purposes of tack welding
- 6.14 identify the factors that affect weld quality
 - use of incorrect nozzle size
 - use of incorrect gas pressures
 - incorrect welding technique
 - inadequate cleanliness of joint
 - damage/contamination on filler rod

UAN:	M/501/9419
Level:	1
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Using manual TIG welding equipment.
Aim:	The unit is designed to enable candidates to demonstrate welding skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete welded joints in simple welding positions and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will: 1. produce beads on plate in the PA flat position
Assessment criteria
The learner can: 1.1 use tungsten inert gas welding techniques safely to produce beads on a plate in simple welding positions 1.2 check joints are aligned and welds are sound and of uniform appearance 1.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 2. produce a lap fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 2.1 use tungsten inert gas welding techniques safely to produce a lap fillet weld in simple welding positions 2.2 check joints are aligned and welds are sound and of uniform appearance 2.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

3. produce a tee fillet weld in the PA flat position

Assessment criteria

The learner can:

- 3.1 use tungsten inert gas welding techniques safely to produce a tee fillet weld in simple welding positions
- 3.2 check joints are aligned and welds are sound and of uniform appearance
- 3.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

4. produce a tee fillet weld in the PB horizontal/vertical position

Assessment criteria

The learner can:

- 4.1 use tungsten inert gas welding techniques safely to produce a tee fillet weld in simple welding positions
- 4.2 check joints are aligned and welds are sound and of uniform appearance
- 4.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

5. produce a corner weld in the PA flat position

Assessment criteria

The learner can:

- 5.1 use tungsten inert gas welding techniques safely to produce a corner weld in simple welding positions
- 5.2 check joints are aligned and welds are sound and of uniform appearance
- 5.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

6. know the process and health & safety requirements for tungsten inert gas (TIG) welding

Assessment criteria

The learner can:

- 6.1 identify the health and safety hazards associated with TIG welding
- 6.2 state the effects of an enriched inert gas atmosphere
 - hazards
 - precautions
- 6.3 identify safety features that protect bystanders
- 6.4 identify the personal protective equipment (PPE) and clothing to be worn during TIG welding
- 6.5 state the storage, handling and safe use of compressed inert gas cylinders
- 6.6 identify the welding specific requirements for TIG welding
- 6.7 identify main components and controls for the process
 - welding plant (d.c. power source)
 - welding current control
 - welding lead
 - welding torch
 - electrode
 - nozzle
 - ignition switch/foot control
 - welding return
 - welding earth
 - shielding gas supply
 - shielding gas type
 - shielding gas pressure regulator
 - shielding gas flow meter
- 6.8 identify the type of current for the process
- 6.9 identify the electrical connections for the process
- 6.10 identify the consumables used for TIG welding
 - electrodes
 - shielding gas
 - filler wires
- 6.11 state the variables associated with the process
 - welding current
 - travel speed
 - shielding gas flow rate
- 6.12 state maintenance requirements
 - electrode
- 6.13 state the function and types of material
 - nozzle
 - electrode
 - collet

- 6.14 state shielding gas requirements
- 6.15 state the defects associated with the process
 - methods of cleaning
 - means of avoiding

Unit 104

Metal Inert Gas Welding

UAN:	H/501/9420
Level:	1
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Using manual MIG/MAG welding equipment.
Aim:	The unit is designed to enable candidates to demonstrate welding skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete welded joints in simple welding positions and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will: 1. produce beads on plate in the PA flat position
Assessment criteria
The learner can: 1.1 use metal inert gas welding techniques safely to produce beads on a plate in simple welding positions 1.2 check joints are aligned and welds are sound and of uniform appearance 1.3 identify defects in the weld using visual checks

Learning outcome
The learner will: 2. produce a lap fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 2.1 use metal inert gas welding techniques safely to produce a lap fillet weld in simple welding positions 2.2 check joints are aligned and welds are sound and of uniform appearance 2.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

3. produce a tee fillet weld in the PA flat position

Assessment criteria

The learner can:

- 3.1 use metal inert gas welding techniques safely to produce a tee fillet weld in simple welding positions
- 3.2 check joints are aligned and welds are sound and of uniform appearance
- 3.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

4. produce a tee fillet weld in the PB horizontal/vertical position

Assessment criteria

The learner can:

- 4.1 use metal inert gas welding techniques safely to produce a tee fillet weld in simple welding positions
- 4.2 check joints are aligned and welds are sound and of uniform appearance
- 4.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

5. produce a corner weld in the PA flat position

Assessment criteria

The learner can:

- 5.1 use metal inert gas welding techniques safely to produce a corner weld in simple welding positions
- 5.2 check joints are aligned and welds are sound and of uniform appearance
- 5.3 identify defects in the weld using visual checks

Learning outcome

The learner will:

6. know the process and health & safety requirements for metal inert gas (MIG) welding

Assessment criteria

The learner can:

- 6.1 identify the health and safety hazards associated with MIG welding
- 6.2 state the effects of exposure to the electric arc
 - hazards
 - precautions
- 6.3 indicate types of fire extinguisher
 - colour
 - type
 - applications
- 6.4 state the effects of exposure to welding fume
 - hazards
 - precautions
- 6.5 identify the personal protective equipment (PPE) and clothing to be worn during MIG welding
- 6.6 identify the welding specific requirements for MIG welding
- 6.7 identify main components and controls for the process
 - welding plant (d.c. power source)
 - wire feed unit/wire reel
 - wire feed speed control
 - voltage control(s)
 - welding lead
 - welding gun
 - contact tip/tube
 - welding return
 - welding earth
 - shielding gas supply
 - shielding gas type
 - shielding gas pressure regulator
 - shielding gas flow meter
- 6.8 identify the type of current for the process
- 6.9 identify the electrical connections for the process
- 6.10 identify the consumables used for MIG welding
 - electrode wire
 - shielding gas
 - contact tip/tube
- 6.11 state the variables associated with the process
 - arc voltage
 - wire feed speed
 - shielding gas flow rate
 - travel speed

- 6.12 state maintenance requirements
 - contact tip/tube burn-back
 - changing the electrode wire
- 6.13 identify modes of metal transfer
 - dip/short circuit
 - globular
 - spray
 - pulse
- 6.14 state the defects associated with the process
 - methods of cleaning
 - means of avoiding

Unit 105

Brazing and Soldering

UAN:	R/506/6250
Level:	1
Credit value:	7
GLH:	38
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Using manual flame brazing and soldering equipment.
Aim:	The unit is designed to enable candidates to demonstrate brazing and soldering skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete brazed and soldered joints in plate and pipe and prepare them for undertaking qualifications at NVQ level 1.

Learning outcome
The learner will: 1. be able to prepare joints for brazing and soldering
Assessment criteria
The learner can: 1.1 select appropriate hand tools and materials for preparing plate and pipe 1.2 prepare and assemble plate and pipe for brazing and soldering
Range
Hand tools: files, de-burring tools, saws, guillotines, tin snips Materials: abrasives

Learning outcome

The learner will:

2. be able to set up, prepare and shut down equipment for brazing and soldering

Assessment criteria

The learner can:

- 2.1 select and set up appropriate brazing and soldering **equipment**
- 2.2 check equipment selected is safe to use
- 2.3 safely shut down selected equipment

Range

Equipment: gas cylinders, regulators, hoses, flashback arrestors, hose check valves, torches, nozzles, electric soldering irons

Learning outcome

The learner will:

3. be able to produce brazed and soldered joints

Assessment criteria

The learner can:

- 3.1 select appropriate **filler metal** and **flux** for **base materials**
- 3.2 produce brazed and soldered **joints** in plate and pipe
- 3.3 check the completed work meets the required standard

Range

Filler metal: (copper/ zinc), (silver/copper/ phosphorous), (copper/ phosphorous), (silver based alloys)

Flux: active, passive

Base materials: carbon steels, stainless steel, copper and copper alloys

Joints: tee, lap, socket

Learning outcome

The learner will:

4. know the technique requirements for brazing and soldering

Assessment criteria

The learner can:

- 4.1 identify the health and safety **hazards** associated with brazing and soldering
- 4.2 identify main **health and safety requirements** for brazing and soldering
- 4.3 identify main **equipment** for brazing and soldering
- 4.4 outline the basic **principles** of brazing and soldering
- 4.5 identify the possible causes of brazing and soldering **defects**
- 4.6 state safe shutting down procedures

Range

Hazards: burns, fire, glare, explosion, fumes, slips, trips and falls

Health and safety requirements: fume extraction, eye protection, personal protective equipment, fire extinguishers, safety signs, safe storage and disposal of chemicals, electrical equipment safety, safe use of oxy-fuel equipment

Equipment: gas cylinders, regulators, hoses, flashback arrestors, hose check valves, torches, nozzles, electric soldering irons (electric and flame heated)

Principles: mechanical and chemical cleaning, intermetallic compounds, thermal mass, wetting, fluxing

Defects: excessive/ insufficient filler metal, pinholes, voids, discontinuities, poor joint fit up, oxidised joints

Evidence requirements:

Please refer to the Practical Assessment Handbook for full details of evidence requirements for this unit.

Unit range:

Materials and joint types are identified within the range and are assessed by tasks in the Practical Assessment Handbook.

Guidance:

1. All plate/sheet sizes to be 150 mm long minimum by nominally 50 mm wide
2. All pipe sizes to be 20 mm – 50 mm nominal bore by 60 mm long
3. The four practical assessments are to be carried out on 1 to 3 mm thick materials
4. Acceptance to be assessed by visual inspection and measurement of the completed component
5. Knowledge questions consist of 15 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Five brazing and soldering generic health and safety questions (pass mark = 5/5)
 - Ten brazing and soldering process specific questions (pass mark = 5/10)
6. Demonstrate safe working practices whilst performing activities.

UAN:	Y/506/6251
Level:	1
Credit value:	7
GLH:	43
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Carry out sheet metal cutting, forming and assembly activities.
Aim:	The unit is designed to enable candidates to demonstrate metal fabrication skills typically found in industry and associated underpinning knowledge to a level that will enable them to produce fabricated components with various features and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will:
1. be able to measure and mark out in preparation for metal fabrication
Assessment criteria
The learner can:
1.1 select and use measuring and marking out equipment
1.2 mark out a range of profiles within tolerance

Range
Equipment: dividers, square, scribe, protractor, straight edge, tape measure, rule, centre punch, dot punch, marking medium, Vernier callipers
Profiles: circular, rectangular, radial, irregular
Tolerance: +/- 3 mm

Learning outcome

The learner will:

2. be able to set up, prepare and shut down equipment for metal cutting, forming and joining

Assessment criteria

The learner can:

- 2.1 select and set up **metal fabrication equipment** and **tools**
- 2.2 check metal fabrication equipment is **safe for use**
- 2.3 safely shut down selected equipment and tools are safely stored away

Range**Metal fabrication equipment:**

Cutting: guillotine (treadle or powered), bench guillotine, pedestal drill

Forming: folders, fly press

Joining: spot welder

Tools: hand drills, hammers, mallets, stakes, tin snips, electric nibblers, electric shears, riveters, de-burring, files, sanders, hand punches

Safe for use: electrical checks, visual equipment checks

Learning outcome

The learner will:

3. be able to produce a selection of fabricated components

Assessment criteria

The learner can:

- 3.1 produce fabricated **components** with various **features**
- 3.2 check completed work meets the required standard and is within **tolerance**

Range

Components: flat plates, boxes, trays

Features: holes, bends, flanges, cut outs, riveted, spot welded

Tolerance: +/- 3 mm

Learning outcome
The learner will: 4. know the process requirement for metal fabrication
Assessment criteria
The learner can: 4.1 identify the health and safety hazards associated with metal fabrication 4.2 identify the main health and safety requirements for fabrication 4.3 identify fabricating equipment and tools 4.4 outline the basic metal cutting principles 4.5 outline the basic metal forming principles 4.6 outline the basic metal joining principles 4.7 state the cause of metal fabrication defects 4.8 describe the safe shut down of the selected equipment 4.9 describe the procedures for ensuring tools are safely stored away

Range
<p>Hazards: trips and falls, sharp edges, manual handling, electrical</p> <p>Health and safety requirements: eye protection, personal protective equipment, fire extinguishers, safety signs</p> <p>Metal fabrication equipment:</p> <p>Cutting: guillotine (treadle or powered), bench guillotine, pedestal drill</p> <p>Forming: folders, fly press</p> <p>Joining: spot welder</p> <p>Tools: hand drills, hammers, mallets, stakes, tin snips, electric nibblers, electric shears, riveters, de-burring, files, sanders, marking out equipment, hand punches</p> <p>Cutting principles: cutting by shear, chip forming</p> <p>Forming principles: bend allowances, spring-back</p> <p>Joining principles: riveting allowances, resistance welding</p> <p>Defects: surface tooling marks, burrs, lack of fusion, misshaped holes</p>

Evidence requirements:

Please refer to the Practical Assessment Handbook for full details of evidence requirements for this unit.

Unit range:

Materials type and thicknesses are identified within the range and are assessed by tasks in the Practical Assessment Handbook.

Guidance:

1. Low carbon steel is the recommended material for this unit, but the use of other materials or a mix of materials is acceptable
2. The three practical assessments are to be carried out on 1 mm to 3 mm thick materials
3. Acceptance to be assessed by visual examination and measurement of component condition
4. Knowledge questions consist of 15 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Five metal fabrication generic health and safety questions (pass mark = 5/5)
 - Ten metal fabrication process specific questions (pass mark = 5/10)
5. Demonstrate safe working practices whilst performing activities.

UAN:	H/506/6253
Level:	1
Credit value:	7
GLH:	42
Relationship to NOS:	This unit is linked to the NVQ Level 1 in Performing Engineering Operations – Cutting and shaping platework components.
Aim:	The unit is designed to enable candidates to demonstrate welding skills typically found in industry and associated underpinning knowledge to a level that will enable them to make a selection of cuts using thermal cutting in different positions and profiles and prepare them for undertaking qualifications at NVQ level 1 and this award at level 2.

Learning outcome
The learner will: 1. be able to measure and mark out in preparation for thermal cutting
Assessment criteria
The learner can: 1.1 select and use equipment for measuring and marking out 1.2 mark out a range of profiles within tolerance

Range
Equipment: rules, squares, dividers, protractors, centre punch, dot punch, scribes, chalk Profiles: rectangular, circular, holes, bevels, radius (internal and external), irregular profiles Tolerance: +/- 3 mm

Learning outcome

The learner will:

2. be able to set up, prepare and shut down equipment for thermal cutting

Assessment criteria

The learner can:

- 2.1 select and set up the appropriate **thermal cutting equipment**
- 2.2 check the equipment selected is **safe to use**
- 2.3 safely shut down the selected equipment

Range**Thermal cutting equipment:**

Oxy-fuel gas cutting: equipment, safe storage of cylinders, hazards from hot metal/sparks, types of gases, cylinders types and identification, flashback arrestors, hose types and identification, connector types and identification, hose check valves, cutting torches, torch cutting guides, nozzles

Plasma cutting: equipment, compressed gas supply, types of gases, hazards from hot metal/sparks, cutting guides, nozzles

Safe to use: electrical connections, earthing, gas leaks, safe storage

Learning outcome

The learner will:

3. be able to make a selection of cuts using thermal cutting techniques

Assessment criteria

The learner can:

- 3.1 produce cuts in different **positions** and **profiles**
- 3.2 produce cuts in a range of **material forms**
- 3.3 check completed work meets the required standard and is within **tolerance**

Range

Positions: flat (down-hand)

Profiles: rectangular, circular, holes, bevels, radius (internal and external), irregular profiles

Material forms: plate, rolled sections

Tolerance: +/- 3 mm

Learning outcome

The learner will:

4. know the process requirement for thermal cutting

Assessment criteria

The learner can:

- 4.1 identify the health and safety **hazards** associated with thermal cutting
- 4.2 identify the main **health and safety requirements** for thermal cutting
- 4.3 identify the main **components** and **controls** for the processes
- 4.4 outline the basic **principles** of thermal cutting
- 4.5 state the cause of thermal cutting **defects**
- 4.6 describe the shutting down procedures

Range

Hazards: burns, fire, glare, explosion, fumes

Health and safety requirements: fume extraction, eye protection, personal protective equipment, fire extinguishers, safety signs

Components: cylinders, cutting torch, flashback arrestors, pressure regulators, hose-check valves, cutting nozzles, compressors, plasma nozzles, plasma shrouds

Controls: gas pressures, flame conditions, nozzles sizes, travel speed

Principles: exothermic reaction, kerf size, equipment choice related to material thickness, material preparation and effect on cut quality, flame types, plasma generation

Defects: partial cut through, excessive dross, drag lines

Evidence requirements:

Please refer to the Practical Assessment Handbook for full details of evidence requirements for this unit.

Unit range:

Profiles are identified within the range and are assessed by tasks in the Practical Assessment Handbook.

Guidance:

1. Components should be produced from 6 mm to 12 mm thick low carbon steel
2. Low carbon steel is the recommended material for this unit, but the use of other materials or a mix of materials is acceptable
3. Material forms identified within the Practical Assessment Handbook
4. Acceptance to be assessed by visual inspection and measurement of the completed component
5. Knowledge questions consist of 15 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Five thermal cutting generic health and safety questions (pass mark = 5/5)
 - Ten thermal cutting process specific questions (pass mark = 5/10)
6. Demonstrate safe working practices at all times whilst performing activities.



Appendix 1 Relationships to other qualifications

Literacy, language, numeracy and ICT skills development

These qualifications can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales – see www.cityandguilds.com/esw



Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line

- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Useful contacts

UK learners General qualification information	T: +44 (0)844 543 0033 E: learnersupport@cityandguilds.com
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: intcg@cityandguilds.com
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: centresupport@cityandguilds.com
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: singlesubjects@cityandguilds.com
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: intops@cityandguilds.com
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: walledgarden@cityandguilds.com
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: business@cityandguilds.com
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

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City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

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