

Level 2 Awards and Certificates in Welding, Fabrication and Thermal Cutting Skills (3268)

March 2024 Version 3.3



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 2 Award in Manual Metal Arc (MMA) Welding	3268-02	500/4746/2
Level 2 Award in Oxy-Acetylene Welding	3268-02	500/4746/2
Level 2 Award in Tungsten Inert Gas (TIG) Welding – Aluminium	3268-02	500/4746/2
Level 2 Award in Tungsten Inert Gas (TIG) Welding	3268-02	500/4746/2
Level 2 Award in Metal Inert Gas (MIG) Welding	3268-02	500/4746/2
Level 2 Certificate in Welding Skills	3268-20	600/4884/0
Level 2 Award in Thermal Cutting Techniques	3268-22 <i>This is no longer available for registration and Certification ends 31/10/2019</i>	601/4171/2
Level 2 Award in Metal Fabrication	3268-23 <i>This is no longer available for registration and Certification ends 31/10/2019</i>	601/4172/4
Level 2 Award in Flux-Cored Arc Welding	3268-24 <i>This is no longer available for registration and Certification ends 31/10/2019</i>	601/4173/6
Level 2 Certificate in Welding, Fabrication and Cutting Skills	3268-25 <i>This is no longer available for registration and Certification ends 31/10/2019</i>	601/4174/8

Version and date	Change detail	Section
1.1 Mar 2013	Amended criteria for acquiring certification	Structure
2.0 June 2014	New qualifications added Added units 206-208	Structure Units
3.0 October 2014	Award qualifications added	Structure
3.1 September 2017	Added TQT details Deleted QCF	Qualification at a glance and Structure Throughout
3.2 August 2018	Closed pathways Identified	Qualification at a glance and Structure
3.3 March 2024	Update of Quality Assurance Statement	Centre Requirements



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1 Introduction

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

Area	Description
Who is the qualification for?	The qualifications at Level 2 are designed for those wishing to build on introductory skills acquired at Level 1.
What does the qualification 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 Engineering NVQs at Level 2.</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 3 Diploma in Engineering (2850)• Level 3 Awards in Advanced Welding Skills (3268-03).

Structure

Awards

To achieve the **Level 2 Award in Manual Metal Arc (MMA) Welding (3268-02)** learners must achieve **7** credits from Unit 201.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
R/501/9428	201	Manual Metal Arc welding	7

To achieve the **Level 2 Award in Oxy-Acetylene Welding (3268-02)**, learners must achieve **7** credits from Unit 202.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Y/501/9429	202	Oxy-acetylene welding	7

To achieve the **Level 2 Award in Tungsten Inert Gas (TIG) Welding - Aluminium (3268-02)**, learners must achieve **7** credits from Unit 203.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
L/501/9430	203	Tungsten Inert Gas (TIG) welding - Aluminium	7

To achieve the **Level 2 Award in Tungsten Inert Gas (TIG) Welding (3268-02)** learners must achieve **7** credits from Unit 204.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
R/501/9431	204	Tungsten Inert Gas welding	7

To achieve the **Level 2 Award in Metal Inert Gas (MIG) Welding (3268-02)**, learners must achieve **7** credits from Unit 205.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
T/501/9423	205	Metal Inert Gas welding	7

To achieve the **Level 2 Award in Thermal Cutting Techniques (3268-22)**, learners must achieve **7** credits from Unit 207. *This is no longer available for registration and Certification ends 31/10/2019*

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
K/506/6254	207	Thermal cutting techniques	7

To achieve the **Level 2 Award in Metal Fabrication (3268-23)**, learners must achieve **7** credits from Unit 206. *This is no longer available for registration and Certification ends 31/10/2019*

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
D/506/6252	206	Metal fabrication	7

To achieve the **Level 2 Award in Flux-Cored Arc Welding (3268-24)**, learners must achieve **7** credits from Unit 208. *This is no longer available for registration and Certification ends 31/10/2019*

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
M/506/6255	208	Flux cored arc welding	7

Certificates

To achieve the **Level 2 Certificate in Welding Skills (3268-20)**, learners must achieve a minimum of **14** credits from Units 201-205.

Please note that learners taking Unit 204 can only claim once (either in low carbon steel or austenitic stainless steel).

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
R/501/9428	201	Manual Metal Arc welding	7
Y/501/9429	202	Oxy-acetylene welding	7
L/501/9430	203	Tungsten Inert Gas (TIG) welding - Aluminium	7
R/501/9431	204	Tungsten Inert Gas welding	7
T/501/9423	205	Metal Inert Gas welding	7

To achieve the **Level 2 Certificate in Welding, Fabrication and Cutting Skills (3268-25)**, learners must achieve **21** credits. **14** credits must come from Units 206 and 207, plus a minimum of **7** credits from 201-205, 208. *This is no longer available for registration and Certification ends 31/10/2019*

Please note that learners taking unit 204 can only claim once (either in low carbon steel or austenitic stainless steel).

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
D/506/6252	206	Metal fabrication	7
K/506/6254	207	Thermal cutting techniques	7
Optional			
R/501/9428	201	Manual Metal Arc welding	7
Y/501/9429	202	Oxy-acetylene welding	7
L/501/9430	203	Tungsten Inert Gas (TIG) welding - Aluminium	7
R/501/9431	204	Tungsten Inert Gas welding	7
T/501/9423	205	Metal Inert Gas welding	7
M/506/6255	208	Flux cored arc 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 2 Award in Manual Metal Arc (MMA) Welding	60	70
Level 2 Award in Oxy-Acetylene Welding	60	70
Level 2 Award in Tungsten Inert Gas (TIG) Welding - Aluminium	60	70
Level 2 Award in Tungsten Inert Gas (TIG) Welding	60	70
Level 2 Award in Metal Inert Gas (MIG) Welding	60	70
Level 2 Award in Thermal Cutting Techniques		
Level 2 Award in Metal Fabrication		
Level 2 Award in Flux-Cored Arc Welding		
Level 2 Certificate in Welding Skills	120	140
Level 2 Certificate in Welding, Fabrication and Cutting Skills		



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-(02 and 20) will be given automatic approval for 3268-24. They will still need to gain qualification approval for 3268-22, 23 and 25.

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

Quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Quality assurance includes initial centre approval, qualification approval and the centre's own internal procedures for monitoring quality. Centres are responsible for internal quality assurance and City & Guilds is responsible for external quality assurance. All external quality assurance processes reflect the minimum requirements for verified and moderated assessments, as detailed in the Centre Assessment Standards Scrutiny (CASS), section H2 of Ofqual's General Conditions. For more information on both CASS and City and Guilds Quality Assurance processes visit: the [What is CASS?](#) and [Quality Assurance Standards](#) documents on the City & Guilds website.

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.
- **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 Handbooks.

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 2. 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
- guided learning hours
- 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:	R/501/9428
Level:	2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering– joining materials by the manual metal arc welding process.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will: 1. produce a butt weld in the PA flat position Produce a butt weld in the PA flat position
Assessment criteria
The learner can: 1.1 use manual metal arc welding techniques safely to produce a butt weld in standard 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 and destructive testing method

Learning outcome
The learner will: 2. produce a multiple-run tee fillet in the PB horizontal/vertical position
Assessment criteria
The learner can: 2.1 add some criteria to this list 2.2 demonstrate personal responsibility, with some sub-text 2.3 identify defects in the weld using visual checks and destructive testing method

Learning outcome
The learner will: 3. produce a lap fillet weld in the PF vertical-up position
Assessment criteria
The learner can: 3.1 use manual metal arc welding techniques safely to produce a lap fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 4. produce a tee fillet weld in the PF vertical-up position
Assessment criteria
The learner can: 4.1 use manual metal arc welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing methods

Learning outcome
The learner will: 5. produce a butt weld in the PF vertical-up position
Assessment criteria
The learner can: 5.1 use manual metal arc welding techniques safely to produce a butt weld in standard 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 and destructive testing methods

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 define the health and safety risks associated with manual metal arc welding
 - precautions
- 6.2 define the types of fire extinguisher for use with electric arc welding
 - colour
 - type
 - applications
- 6.3 define methods of managing welding fume hazards
 - types
 - effects
 - precautions
- 6.4 define hazards associated with arc radiation
 - types
 - effects
 - precautions
- 6.5 define the personal protective equipment (PPE) and clothing requirements for manual metal arc welding
- 6.6 define the welding specific requirements for manual metal arc welding
- 6.7 select the welding power source for manual metal arc welding
 - alternating current (a.c.)
 - direct current (d.c.)
- 6.8 define cables and connections used
 - checks required
- 6.9 select types of electrodes
 - size
 - covering
- 6.10 select pre-welding activities
 - cleaning methods
 - joint preparations
- 6.11 select methods of distortion control
 - welding in sequence
 - tacking
 - pre-setting/cambering/bending
 - restraint
 - pre-heating
 - joint design
- 6.12 define the factors that influence weld quality

UAN:	Y/501/9429
Level:	2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering – joining materials by the manual gas welding process.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will:
1. produce a square butt weld in the PA flat position
Assessment criteria
The learner can:
1.1 use Oxy Acetylene welding techniques safely to produce a square butt weld in standard 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 and destructive testing methods

Learning outcome
The learner will:
2. produce a tee fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can:
2.1 use Oxy Acetylene welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing methods

Learning outcome
The learner will: 3. produce a lap fillet weld in PF vertical-up position
Assessment criteria
The learner can: 3.1 use Oxy Acetylene welding techniques safely to produce a lap fillet weld in standard 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 and destructive testing methods

Learning outcome
The learner will: 4. produce a corner weld in the PF vertical-up position
Assessment criteria
The learner can: 4.1 use Oxy Acetylene welding techniques safely to produce a corner weld in standard 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 and destructive testing methods

Learning outcome
The learner will: 5. produce a brazed corner joint in the PA flat position
Assessment criteria
The learner can: 5.1 use Oxy Acetylene welding techniques safely to produce a brazed corner joint in standard 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 and destructive testing methods

Learning outcome

The learner will:

6. know the Process and Health & Safety requirements for Oxy-acetylene welding

Assessment criteria

The learner can:

- 6.1 explain the health and safety risks associated with oxy-acetylene welding
 - precautions
- 6.2 explain methods of managing welding fume hazards
 - types
 - effects
 - precautions
- 6.3 explain the personal protective equipment (PPE) and clothing and respiratory protective equipment (RPE) requirements for oxy-acetylene welding
- 6.4 explain the types of fire extinguisher for use with electric arc welding
 - colour
 - type
 - applications
- 6.5 explain the storing handling and safe use of compressed gas cylinders
- 6.6 explain the safe use and assembly of oxy-acetylene welding gas hoses and connections
- 6.7 define the welding specific requirements for oxy-acetylene welding
- 6.8 describe the correct procedure for oxy-acetylene torch ignition and extinguishing
- 6.9 describe the slope and tilt angles for the torch and filler rod when using the leftward welding technique
- 6.10 describe pre welding/brazing activities
 - cleaning
- 6.11 describe post welding/brazing activities
 - cleaning
 - visual inspection
- 6.12 define the factors that influence weld quality
- 6.13 define workshop-based destructive tests
 - bend (root face or side – accept any one bend test answer)
 - nick-break (fracture)
 - macro-examination cupping test

Unit 203

Tungsten Inert Gas (TIG) welding - Aluminium

UAN:	L/501/9430
Level:	2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering – joining materials by the manual TIG and plasma arc welding process.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will: 1. produce a butt weld in the PA flat position
Assessment criteria
The learner can: 1.1 use tungsten inert gas welding techniques safely to produce a butt weld in standard 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 and destructive testing method

Learning outcome
The learner will: 2. produce a lap fillet weld in 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 standard 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 and destructive testing method

Learning outcome
The learner will: 3. produce a tee fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 3.1 use tungsten inert gas welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 4. produce a tee fillet weld in the PF vertical-up position
Assessment criteria
The learner can: 4.1 use tungsten inert gas welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 5. produce a tube-to-sheet tee fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 5.1 use tungsten inert gas welding techniques safely to produce a tube-to-sheet fillet weld in standard 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 and destructive testing method

Learning outcome

The learner will:

6. know the Process and Health & Safety requirements for Tungsten Inert Gas (aluminium) welding

Assessment criteria

The learner can:

- 6.1 define the health and safety risks associated with TIG welding
 - precautions
 - high frequency spark
 - using etching solutions
- 6.2 define hazards associated with arc radiation
 - types
 - effects
 - precautions
- 6.3 define the storing handling and safe use of compressed inert gas cylinders
- 6.4 define the welding specific requirements for TIG welding
- 6.5 define the types of power source used for TIG welding
 - transformer/rectifier
 - generator
 - inverter
- 6.6 define the types of current for the process
 - applications for d.c.
 - applications for a.c.
 - applications for electrodes
- 6.7 define methods of arc ignition
 - touch or scratch
 - high frequency or HF
 - lift
- 6.8 define the function of slope in/out controls
- 6.9 define the construction of a TIG welding torch
 - body/handle
 - head
 - connections
 - contactor/switch
 - back cap
 - nozzle
 - collet
 - collet holder
 - electrode
 - gas lens
- 6.10 define types of shielding gas / gas mixtures used for TIG welding
 - argon
 - helium
 - argon/hydrogen (h2) for austenitic stainless steels
 - argon/helium
 - helium/argon

- oxygen-free nitrogen for copper
- argon/nitrogen for copper
- 6.11 define gas output control
 - pressure regulation
 - flow rate
- 6.12 select methods of distortion control
 - welding in sequence
 - tacking
 - pre-setting/cambering/bending
 - restraint
 - pre-heating
 - joint design
- 6.13 define maintenance requirements
 - electrode
- 6.14 select types of welded joint
 - lap
 - butt
 - tee
 - corner
- 6.15 select types of weld
- 6.16 select welding positions in accordance with EN ISO 6947 and ASME IX

UAN:	R/501/9431
Level:	2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering – joining materials by the manual TIG and plasma arc welding process.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will:
1. produce a butt weld in the PA flat position
Assessment criteria
The learner can:
1.1 use tungsten inert gas welding techniques safely to produce a butt weld in standard 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 and destructive testing method

Learning outcome
The learner will:
2. produce a lap fillet weld in the PF vertical-up position
Assessment criteria
The learner can:
2.1 use tungsten inert gas welding techniques safely to produce a lap fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 3. produce a tee fillet weld in the PF vertical-up position
Assessment criteria
The learner can: 3.1 use tungsten inert gas welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 4. produce a butt weld in the PF vertical-up position
Assessment criteria
The learner can: 4.1 use tungsten inert gas welding techniques safely to produce a butt fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 5. produce a tube-to-plate tee fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 5.1 use tungsten inert gas welding techniques safely to produce a tube-to-plate tee fillet weld in standard 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 and destructive testing method

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 define the health and safety risks associated with TIG welding
 - precautions
 - high frequency spark
 - using etching solutions
- 6.2 define hazards associated with arc radiation
 - types
 - effects
 - precautions
- 6.3 define the storing handling and safe use of compressed inert gas cylinders
- 6.4 define the welding specific requirements for TIG welding
- 6.5 define the types of power source used for TIG welding
 - transformer/rectifier
 - generator
 - inverter
- 6.6 define the types of current for the process
 - applications for d.c.
 - applications for a.c.
 - applications for electrodes
- 6.7 define methods of arc ignition
 - touch or scratch
 - high frequency or HF
 - lift
- 6.8 define the function of slope in/out controls
- 6.9 define the construction of a TIG welding torch
 - body/handle
 - head
 - connections
 - contactor/switch
 - back cap
 - nozzle
 - collet
 - collet holder
 - electrode
 - gas lens
- 6.10 define types of shielding gas / gas mixtures used for TIG welding
 - argon
 - helium
 - argon/hydrogen (h2) for austenitic stainless steels
 - argon/helium
 - helium/argon

- oxygen-free nitrogen for copper
- argon/nitrogen for copper
- 6.11 define gas output control
 - pressure regulation
 - flow rate
- 6.12 select methods of distortion control
 - welding in sequence
 - tacking
 - pre-setting/cambering/bending
 - restraint
 - pre-heating
 - joint design
- 6.13 define maintenance requirements
 - electrode
- 6.14 select types of welded joint
 - lap
 - butt
 - tee
 - corner
- 6.15 select types of weld
- 6.16 select welding positions in accordance with EN ISO 6947 and ASME IX

UAN:	T/501/9423
Level:	2
Credit value:	7
GLH:	60
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering– joining materials by the manual MIG/MAG and other continuous wire welding processes.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will: 1. produce a butt weld in the PA flat position
Assessment criteria
The learner can: 1.1 use metal inert gas welding techniques safely to produce a butt weld in standard 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 and destructive testing method

Learning outcome
The learner will: 2. produce a lap fillet weld in the vertical position
Assessment criteria
The learner can: 2.1 use metal inert gas welding techniques safely to produce a lap fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 3. produce a tee fillet weld in the vertical position
Assessment criteria
The learner can: 3.1 use metal inert gas welding techniques safely to produce a tee fillet weld in standard 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 and destructive testing method

Learning outcome
The learner will: 4. produce a butt weld in the vertical position
Assessment criteria
The learner can: 4.1 use metal inert gas welding techniques safely to produce a butt weld in standard 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 and destructive testing method

Learning outcome
The learner will: 5. produce a tube-to-plate tee fillet weld in the PB horizontal/vertical position
Assessment criteria
The learner can: 5.1 use metal inert gas welding techniques safely to produce a tube-to-plate tee weld in standard 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 and destructive testing method

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 define the health and safety risks associated with MIG welding
 - precautions
- 6.2 define the types of fire extinguisher for use with electric arc welding
 - colour
 - type
 - applications
- 6.3 define methods of managing welding fume hazards
 - types
 - effects
 - precautions
- 6.4 define hazards associated with arc radiation
 - types
 - effects
 - precautions
- 6.5 define the welding specific requirements for MIG welding
- 6.6 define the types of power source used for TIG welding
 - transformer/rectifier
 - generator
 - inverter
- 6.7 define types of induction control used in MIG welding systems
 - fixed
 - stepped
 - variable
- 6.8 define the construction of a MIG welding gun/torch
 - body/handle
 - neck
 - connections
 - contactor/switch
 - nozzle
 - gas diffuser/ports
 - electrode wire
 - contact tip/tube
- 6.9 define types of shielding gas mixtures used commonly for MIG welding steels
 - argon/carbon dioxide (CO₂)
 - carbon dioxide (CO₂)
 - argon/oxygen (O₂)/carbon dioxide (CO₂)
 - argon/oxygen (O₂)
 - argon/helium/oxygen (O₂)/carbon dioxide (CO₂)
- 6.10 define gas output control

- pressure regulation
- flow rate
- 6.11 distinguish between modes of metal transfer
 - dip/short-circuiting
 - globular
 - spray
 - pulse
- 6.12 define workshop-based destructive tests
 - bend (root face or side – accept any one bend test answer)
 - nick-break (fracture)
 - macro-examination
 - cupping test
- 6.13 select types of welded joint
 - lap
 - butt
 - tee
 - corner
- 6.14 select types of weld
 - welding symbols
- 6.15 select welding positions accordance with EN ISO 6947 and ASME IX

Unit 206

Metal fabrication

UAN:	D/506/6252
Level:	2
Credit value:	7
GLH:	39
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering.
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 complete welded joints in standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

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, use of templates Profiles: circular, rectangular, radial, irregular, triangular Tolerance: +/- 2 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 and tools are safe for use 2.3 safely shut down selected equipment and safely store away tools

Range
Equipment: Cutting: guillotine (treadle or powered), bench guillotine, pedestal drill Forming: folders, bending rolls, fly press Joining: spot welder, TIG welder, MIG 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: boxes, trays, cylinders, cones
Features: holes, bends, flanges, radii, cut outs, riveted, spot welded, mechanical fasteners, welded joints
Tolerance: +/- 2 mm

Learning outcome
The learner will: 4. be able to join metal using a range of techniques
Assessment criteria
The learner can: 4.1 produce metal fabrications using mechanical jointing 4.2 produce metal fabrications with fusion welded joints 4.3 produce metal fabrications using adhesive joints

Range
Mechanical jointing: riveting (hollow and solid), screws,
Fusion welding: spot welds, TIG welding, MIG welding
Adhesive joints: two-part epoxy

Learning outcome
The learner will: 5. know the process requirement for metal fabrication
Assessment criteria
The learner can: 5.1 identify the health and safety hazards associated with metal fabrication 5.2 identify the main health and safety requirements for fabrication 5.3 identify powered fabricating equipment and tools 5.4 outline the basic principles of metal cutting 5.5 outline the basic principles of metal forming 5.6 outline the basic principles of mechanical joining 5.7 outline the basic principles of fusion welding 5.8 outline the basic principles of adhesive joining 5.9 state the cause of metal fabrication defects 5.10 describe the safe shut down of the selected equipment 5.11 describe the procedures for ensuring tools are safely stored away

Range
<p>Hazards: burns, fire, trips and falls, sharp edges, manual handling, electrical, fumes, welding radiation</p> <p>Health and safety requirements: eye protection, personal protective equipment, electrical safety, equipment safety, fire extinguishers, safety signs</p> <p>Equipment: Cutting: guillotine (treadle or powered), bench guillotine, pedestal drill Forming: folders, bending rolls, fly press Joining: spot welder, TIG welder, MIG welder</p> <p>Tools: hand drills, hammers, mallets, stakes, tin snips, electric nibblers, electric shears, riveters, de-burring, files, sanders, hand punches, marking out tools</p> <p>Cutting principles: cutting by shear, chip forming, thermal (plasma)</p> <p>Forming principles: bend allowances, rolling allowances, pre-setting, springback</p> <p>Mechanical and adhesive joining principles: riveting allowances, resistance welding, TIG welding, MIG welding, shielding gases, adhesives</p> <p>Mechanical joining: riveting (hollow and solid), screws</p> <p>Fusion welding: spot welds, TIG welding, MIG welding</p> <p>Adhesive: two-part epoxy</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:

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

Guidance:

1. Material types to be limited to low carbon steel including galvanised sheet
2. The three practical assessments are to be carried out on 0.8 to 3 mm thick materials
3. Acceptance to be assessed by visual inspection and measurement of the completed component
4. Knowledge questions consist of 20 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Eight metal fabrication generic health and safety questions (pass mark = 8/8)
 - Twelve metal fabrication process specific questions (pass mark = 8/12)
5. Pattern development is not a requirement of this unit. Templates, where appropriate, can be supplied
6. Demonstrate safe working practices whilst performing activities.

UAN:	K/506/6254
Level:	2
Credit value:	7
GLH:	41
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering.
Aim:	The unit is designed to enable candidates to demonstrate thermal cutting skills typically found in industry and associated underpinning knowledge to a level that will enable them to complete welded joints in standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

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: +/- 2 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 assembly, safe storage of cylinders, types of gasses, cylinders types and identification, flashback arrestors, hose types and identification, connector types and identification, hose check valves, cutting torches, torch cutting guides, nozzles, portable track cutting machines Plasma cutting: equipment, compressed gas supply, types of gasses, 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, straight lines using track cutting machines Material forms: plate, rolled sections, pipes Tolerance: +/- 2 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 main **health and safety requirements** for thermal cutting
- 4.3 identify 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, manual handling and storage of gas cylinders, equipment checks

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, CNC control

Principles: exothermic reaction, kerf size, equipment choice related to material thickness, material preparation and effect on cut quality, flame types, gas selection, plasma definition, transferred arc, distortion control

Defects: partial cut through, excessive dross, drag lines, ovality due to expansion

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. Material limited to a thickness range of 1.6 – 12 mm
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 20 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Eight thermal cutting generic health and safety questions (pass mark = 8/8)
 - Twelve thermal cutting process specific questions (pass mark = 8/12)
6. Demonstrate safe working practices at all times whilst performing activities.

UAN:	M/506/6255
Level:	2
Credit value:	7
GLH:	40
Relationship to NOS:	This unit is linked to the NVQ Level 2 in Fabrication and welding engineering.
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 standard welding positions and prepare them for undertaking qualifications at NVQ level 2 and at level 3.

Learning outcome
The learner will:
1. be able to prepare joints for flux cored arc welding
Assessment criteria
The learner can:
1.1 prepare plate edges for flux cored arc welding using hand tools and ancillary equipment
1.2 set up and tack joints for flux cored arc welding

Range
Hand tools: files, grinders, wire brushes
Ancillary equipment: edge preparation equipment, jigs, magnets
Joints: tee, lap, corner, butt

Learning outcome
The learner will: 2. be able to set up, prepare and shut down equipment used for flux cored arc welding
Assessment criteria
The learner can: 2.1 check equipment is safe to use 2.2 set up flux cored arc welding equipment for safe use 2.3 shut down flux cored arc welding equipment after use

Range
Check equipment: electrical checks, risk assessments, gas leaks, good house keeping Set up: polarity, voltages, wire feed speed, gas flow rates

Learning outcome
The learner will: 3. be able to produce flux cored arc welded joints to the required standard
Assessment criteria
The learner can: 3.1 produce flux cored arc welded joints in standard positions 3.2 inspect flux cored arc welded joints to ensure required standard has been attained

Range
Joints: tee, lap, corner, butt Positions: PA (flat), PB (horizontal/vertical), PF (vertical up) Inspection: Non-destructive: visual Destructive: bend, nick break, macro-etch, cupping test

Learning outcome
The learner will: 4. know the process requirements for flux cored arc welding
Assessment criteria
The learner can: 4.1 identify health and safety hazards associated with flux cored arc welding 4.2 identify the main health and safety requirements for flux cored arc welding 4.3 describe the basic principles of flux cored arc welding 4.4 identify main equipment for flux cored arc welding 4.5 describe the process variables and consumables for flux cored arc welding 4.6 identify welding positions as defined in the relative standards 4.7 describe workshop inspection methods 4.8 state the cause of and prevention of flux cored arc welded joint defects 4.9 describe the shutting down procedure for flux cored arc welding equipment

Range
Hazards: radiation, heat, fumes, electricity, slips, trips and falls Health & safety requirements: eye protection, personal protective equipment, fire extinguishers, safety signs, extraction and ventilation, electrical protection Principles: metal transfer, electrical polarity, shielding gas control Equipment: power sources, torches, wire feeders, gas regulators, gas flow meters Process variables: voltage, wire feed, gas flow, induction Consumables: shielding gases, electrode wire Positions: PA (flat), PB (horizontal/vertical), PF (vertical up) Inspection methods: Non-destructive: visual Destructive: bend, nick break, macro-etch, cupping test Defects: distortion, cracks, porosity, undercut, lack of fusion, lack of penetration, slag inclusions, spatter

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 200 mm long minimum by nominally 50 mm wide
2. The five practical assessments are to be carried out on 0.8 to 3 mm thick or 5 to 10 mm thick materials
3. Acceptance to be assessed by inspection methods identified within the Practical Assessment Handbook
4. Knowledge questions consist of 20 set oral questions for each qualification based on qualification handbook knowledge requirements:
 - Eight Flux Cored Arc Welding generic health and safety questions (pass mark = 8/8)
 - Twelve Flux Cored Arc Welding specific questions (pass mark = 8/12)
5. Demonstrate safe working practices 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
- NVQ Code of Practice

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 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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