

Level 3 NVQ Diploma in Fabrication and Welding – Manual Welding (1782-30)

September 2018 version 1.1



Qualification at a glance

Subject area	Engineering
City & Guilds number	1782-30
Age group approved	16+
Entry requirements	None
Assessment	Portfolio of evidence
Automatic approval	Available
Support materials	Centre handbook
Registration/ certification dates	See City & Guilds website for details

Title and level	City & Guilds number	Accreditation number
Level 3 NVQ Diploma in Fabrication and Welding Engineering – Manual Welding	1782-30	601/0078/3

Version and date	Change detail	Section
1.1 September 2018	Changed from a seven to nine	Unit 201 assessment criteria 2.3



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1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	It is for learners who work or want to work as fabrication and welding engineers in the engineering sector.
What does the qualification cover?	It allows learners to learn, develop and practise the skills required for employment and/or career progression in the fabrication and welding engineering sector.
Is the qualification part of a framework or initiative?	It serves as a competence qualification, in the Engineering Apprenticeship framework.
Who did we develop the qualification with?	It was developed in association with SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
What opportunities for progression are there?	It allows learners to progress into employment or to the following City & Guilds qualifications: <ul style="list-style-type: none">• Level 3 NVQ Extended Diploma in Fabrication and Welding Engineering

Structures

The minimum credit required to achieve this qualification is **185 credits**.

To achieve the **Level 3 NVQ Diploma in Fabrication and Welding Engineering (Manual Welding)**, learners **must** achieve **15** credits from the mandatory units (201-202, 303) and **must** achieve a minimum of **170** credits from any **one** of the optional units 304-309.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/5013	201	Complying with statutory regulations and organisational safety requirements	5
Y/601/5102	202	Using and interpreting engineering data and documentation	5
K/601/5055	303	Working efficiently and effectively in engineering	5
Optional			
F/504/9170	304	Welding Materials by the Manual Metal Arc Process	175
J/504/9171	305	Welding Materials by the Semi-Automatic MIG/MAG and Flux Cored Arc Processes	175
L/504/9172	306	Welding Materials by the Manual TIG and Plasma Arc Welding Process	175
R/504/9173	307	Welding Materials by the Manual Oxy/Fuel Gas Welding Process	170
Y/504/9174	308	Welding Pipe/Tube using Multiple Manual Arc Welding Processes	180
H/504/9176	309	Welding Plate using Multiple Manual Arc Welding Processes	180

- If the learner is undertaking this pathway as part of the Extended Diploma, the Extended Diploma handbook must be referred to in order to determine the additional qualification and credit requirements.



2 Centre requirements

Approval

Centres currently offering the City & Guilds Level 3 NVQ in Fabrication and Welding Engineering (1781) will be automatically approved to run this new qualification.

To offer this qualification new centres will need to gain both centre and qualification approval. Please refer to the Centre Manual - Supporting Customer Excellence for further information.

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

Resource requirements

Centre staffing

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

- be occupationally competent or technically knowledgeable in the area[s] 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 verifier

Assessor Requirements to Demonstrate Effective Assessment Practice

Assessment must be carried out by competent Assessors that as a minimum must hold the QCF Level 3 Award in Assessing Competence in the Work Environment. Current and operational assessors that hold units D32 and/or D33 or A1 and/or A2 as appropriate for the assessment requirements set out in this Unit Assessment Strategy. However, they will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace assessment to the most up to date National Occupational Standards (NOS)

Assessor Technical Requirements

Assessors must be able to demonstrate that they have verifiable, relevant and sufficient technical competence to evaluate and judge performance

and knowledge evidence requirements as set out in the relevant QCF unit learning outcomes and associated assessment criteria.

This will be demonstrated either by holding a relevant technical qualification or by proven industrial experience of the technical areas to be assessed. The assessor's competence must, at the very least, be at the same level as that required of the learner(s) in the units being assessed.

Assessors must also be:

Fully conversant with the Awarding Organisation's assessment recording documentation used for the QCF NVQ units against which the assessments and verification are to be carried out, other relevant documentation and system and procedures to support the QA process.

Verifier Requirements (internal and external)

Internal quality assurance (Internal Verification) must be carried out by competent Verifiers that as a minimum must hold the QCF Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practices. Current and operational Internal Verifiers that hold internal verification units V1 or D34 will not be required to achieve the QCF Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the QCF Level 3 Award in Assessing Competence in the Work Environment.

External quality assurance (**External Verification**) must be carried out by competent External Verifiers that as a minimum must hold the QCF Level 4 Award in the External Quality Assurance of Assessment Processes and Practices. Current and operational External Verifiers that hold external verification units V2 or D35 will not be required to achieve the QCF Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the QCF Level 3 Award in Assessing Competence in the Work Environment

External and Internal Verifiers will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace Quality Assurance (verification) of Assessment Processes and Practices to the most up to date National Occupational Standards (NOS) Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the QCF NVQ units against which the assessments and verification are to be carried out, the appropriate Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation,

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

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully so should have the opportunity to gather work based evidence.

The SEMTA Engineering Manufacture apprenticeship framework suggests that:

Employers would be interested in candidates that:

- Are keen and motivated to work in an engineering environment
- Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
- Have previous work experience or employment in the sector
- Have completed a 14 to 19 Diploma in Engineering or Manufacturing
- Have completed a Young Apprenticeship in Engineering or other related area
- Have GCSEs in English, Maths and Science
- Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness.

As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science. The selection process on behalf of employers may include initial assessment where applicants will be asked if they have any qualifications or experience that can be accredited against the requirements of the apprenticeship. They may also be required to take tests in basic numeracy and literacy, communications skills and spatial awareness. There may also be an interview to ensure applicants have selected the right occupational sector and are motivated to become an apprentice, as undertaking an apprenticeship is a major commitment for both the individual and the employer.'

Assessment Environment (extract from SEMTA QCF Unit Assessment Strategy 1 January 2011)

The evidence put forward for this qualification can only be regarded valid, reliable, sufficient and authentic if achieved and obtained in the working environment and be clearly attributable to the learner. However, in certain circumstances, simulation/replication of work activities may be acceptable.

- The use of high quality, realistic simulations/replication, which impose pressures which are consistent with workplace expectations, should only be used in relation to the assessment of the following:-
 - rare or dangerous occurrences, such as those associated with health, safety and the environment issues, emergency scenarios and rare operations at work;
 - the response to faults and problems for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence;

- aspects of working relationships and communications for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence.

Simulations/replications will require prior approval from centres City & Guilds external verifier/qualification consultant and should be designed in relation to the following parameters: -

- the environment in which simulations take place must be designed to match the characteristics of the working environment
- competencies achieved via simulation/replication must be transferable to the working environment
- simulations which are designed to assess competence in dealing with emergencies, accidents and incidents must be verified as complying with relevant health, safety and environmental legislation by a competent health and safety/environmental control officer before being used
- simulated activities should place learners under the same pressures of time, access to resources and access to information as would be expected if the activity was real
- simulated activities should require learners to demonstrate their competence using plant and/or equipment used in the working environment
- simulated activities which require interaction with colleagues and contacts should require the learner to use the communication media that would be expected at the workplace
- for health and safety reason simulations need not involve the use of genuine substances/materials. Any simulations which require the learner to handle or otherwise deal with materials substances/should ensure that the substitute takes the same form as in the workplace

Age restrictions

City & Guilds cannot accept any registrations for candidates under 16 as this qualification is not approved for under 16s.

Legal restrictions apply to candidates under the age of 18 working unsupervised with children. Centres and candidates should be fully aware of minimum age requirements in their home nation and any implications for completing assessments.



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[s].
- any units they have already completed, or credit they have accumulated which is relevant to the qualification[s].
- 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[s], their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Recommended delivery strategies

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

Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their candidates
- satisfies the requirements of the qualifications.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualifications. This might include the following:

- literacy, language and/or numeracy
- personal learning and thinking
- personal and social development
- employability

Where applicable, this could involve enabling the candidate to access relevant qualifications covering these skills.

Recording documents

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

City & Guilds endorses several ePortfolio systems. 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

Candidates must:

- have a completed portfolio of evidence for each unit chosen

Time constraints

The following must be applied to the assessment of this qualification:

- Candidates must finish their assessment within the period of registration

Evidence requirements

Carrying Out Assessments

The NVQ units were specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the learners choice of “bulleted items” listed in the unit assessment criteria.

Where the assessment criteria gives a choice of bulleted items (for example ‘any three from five’), assessors should note that learners do not need to provide evidence of the other items to complete the unit (in this example, two) items, particularly where these additional items may relate to other activities or methods that are not part of the learners normal workplace activity or area of expertise.

Minimum Performance Evidence Requirements

Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent, competent performance for a unit, a minimum of 3 different examples of performance must be provided, and must be sufficient to show that the assessment criteria have been achieved to the prescribed standards. It is possible that some of the bulleted items in the assessment criteria may be covered more than once. The assessor and learner need to devise an assessment plan to ensure that performance evidence is sufficient to cover all the specified assessment criteria and which maximises the opportunities to gather evidence. Where applicable, performance evidence may be used for more than one unit.

The most effective way of assessing competence, is through direct observation of the learner. Assessors must make sure that the evidence provided reflects the learner’s competence and not just the achievement of a training programme.

Evidence that has been produced from team activities, for example, maintenance or installation activities is only valid when it clearly relates to the learners specific and individual contribution to the activity, and not to the general outcome(s).

Each example of performance evidence will often contain features that apply to more than one unit, and can be used as evidence in any unit where appropriate.

Performance evidence must be a combination of:

- outputs of the learner's work, such as items that have been manufactured, installed, maintained, designed, planned or quality assured, and documents produced as part of a work activity together with:
- evidence of the way the learner carried out the activities such as witness testimonies, assessor observations or authenticated learner reports, records or photographs of the work/activity carried out, etc.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units contain statements that require the learner to provide evidence that proves they are capable of combining the various features and techniques. Where this is the case, separate fragments of evidence would not provide this combination of features and techniques and will not, therefore, be acceptable as demonstrating competent performance.

If there is any doubt as to what constitutes valid, authentic and reliable evidence, the internal and/or external verifier (qualifications consultant) should be consulted.

Assessing knowledge and understanding

Knowledge and understanding are key components of competent performance, but it is unlikely that performance evidence alone will provide enough evidence in this area. Where the learner's knowledge and understanding (and the handling of contingency situations) is not apparent from performance evidence, it must be assessed by other means and be supported by suitable evidence.

Knowledge and understanding can be demonstrated in a number of different ways. Semta (the Sector Skills Council) expects oral questioning and practical demonstrations to be used, as these are considered the most appropriate for these units. Assessors should ask enough questions to make sure that the learner has an appropriate level of knowledge and understanding, as required by the unit.

Evidence of knowledge and understanding will **not** be required for those bulleted items in the assessment criteria that have not been selected by the learner.

The achievement of the specific knowledge and understanding requirements of the units cannot simply be inferred by the results of tests or assignments from other units, qualifications or training programmes. Where evidence is submitted from these sources, the assessor must, as with any assessment, make sure the evidence is valid, reliable, authentic, directly attributable to the learner, and meets the full knowledge and understanding requirements of the unit. Where oral questioning is used the assessor must retain a record of the questions asked, together with the learner's answers.

Witness testimony

Where 'observation is used to obtain performance evidence, this must be carried out against the unit assessment criteria. Best practice would require that such observation is carried out by a qualified Assessor. If this is not practicable, then alternative sources of evidence may be used.

For example, the observation may be carried out against the assessment criteria by someone else that is in close contact with the learner. This could be a team leader, supervisor, mentor or line manager who may be regarded as a suitable witness to the learner's competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the learner. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the learner's competency are reliable, auditable and technically valid.

Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification.

RPL is allowed and is also sector specific.



5 Units

Availability of units

The following units can also be obtained from The Register of Regulated Qualifications: <http://registerofqual.gov.uk/Unit>

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
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria.

Unit 201

Complying with statutory regulations and organisational safety requirements

UAN:	A/601/5013
Level:	2
Credit value:	5
GLH:	35
Relationship to NOS:	This unit has been derived from SEMTA national occupational standard: Complying with statutory regulations and organisational safety requirements (Suite 2).
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.</p> <p>The learner will be expected to comply with all relevant regulations that apply to their area of work, as well as their general responsibilities as defined in the Health and Safety at Work Act. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.</p> <p>The learner will also be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.</p>

The learner's responsibilities will require them to comply with all relevant statutory and organisational policy and procedures for health and safety in the workplace. The learner must act in a responsible and safe manner at all times, and present themselves in the workplace suitably prepared for the activities to be undertaken. The learner will be expected to report any problems with health and safety issues, to the relevant authority.

The learner's knowledge will provide a good understanding of the relevant statutory regulations and organisational requirements associated with their work, and will provide an informed approach to the procedures used. The learner will need to understand their organisation's health and safety requirements and their application, in adequate depth to provide a sound basis for carrying out their activities in a safe and competent manner.

Learning outcome	The learner will:
1. comply with statutory regulations and organisational safety requirements	
Assessment criteria	
<p>The learner can:</p> <ul style="list-style-type: none"> 1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: <ul style="list-style-type: none"> a. applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act b. identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: <ul style="list-style-type: none"> i. eye protection and personal protective equipment (PPE) ii. COSHH regulations iii. risk assessments c. identifying the warning signs and labels of the main groups of hazardous or dangerous substances d. complying with the appropriate statutory regulations at all times 1.3 present themselves in the workplace suitably prepared for the activities to be undertaken 1.4 follow organisational accident and emergency procedures 1.5 comply with emergency requirements, to include: <ul style="list-style-type: none"> a. identifying the appropriate qualified first aiders and the location of first aid facilities b. identifying the procedures to be followed in the event of injury to themselves or others c. following organisational procedures in the event of fire and the evacuation of premises d. identifying the procedures to be followed in the event of 	

dangerous occurrences or hazardous malfunctions of equipment
1.6 recognise and control hazards in the workplace
1.7 identify the hazards and risks that are associated with the following: <ol style="list-style-type: none"> a. their working environment b. the equipment that they use c. materials and substances (where appropriate) that they use d. working practices that do not follow laid-down procedures
1.8 use correct manual lifting and carrying techniques
1.9 demonstrate one of the following methods of manual lifting and carrying: <ol style="list-style-type: none"> a. lifting alone b. with assistance of others c. with mechanical assistance
1.10 apply safe working practices and procedures to include: <ol style="list-style-type: none"> a. maintaining a tidy workplace, with exits and gangways free from obstruction b. using equipment safely and only for the purpose intended c. observing organisational safety rules, signs and hazard warnings d. taking measures to protect others from any harm resulting from the work that they are carrying out.

Learning outcome	The learner will:
2.	know how to comply with statutory regulations and organisational safety requirements
Assessment criteria	
The learner can:	
2.1	describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation (such as The Management of Health and Safety at Work Regulations, Workplace Health and Safety and Welfare Regulations, Personal Protective Equipment at Work Regulations, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations)
2.2	describe the specific regulations and safe working practices and procedures that apply to their work activities
2.3	describe the warning signs for the nine main groups of hazardous substances defined by classification, packaging and labelling of dangerous substances regulations
2.4	explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed
2.5	explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)
2.6	describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace

- 2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)
- 2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments)
- 2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury
- 2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is injured
- 2.11 describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report their presence at the appropriate assembly point
- 2.12 describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them
- 2.13 describe the protective clothing and equipment that is available for their areas of activity
- 2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available
- 2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping
- 2.16 describe the importance of safe storage of tools, equipment, materials and products
- 2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve.

Unit 202

Using and interpreting engineering data and documentation

UAN:	Y/601/5102
Level:	2
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from SEMTA national occupational standard: Using and interpreting engineering data and documentation (Suite 2).
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. They will be expected to report any problems with the use and interpretation of the documents that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions if necessary, with an appropriate level of supervision or as a member of a team, and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.</p>

The learner's underpinning knowledge will provide a good understanding of the types of documentation used, and will provide an informed approach to applying instructions and procedures. They will be able to read and interpret the documentation used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learning outcome	The learner will:
1.	use and interpret engineering data and documentation
Assessment criteria	
The learner can:	
1.1	use the approved source to obtain the required data and documentation
1.2	use the data and documentation and carry out all of the following: <ol style="list-style-type: none"> a. check the currency and validity of the data and documentation used b. exercise care and control over the documents at all times c. correctly extract all necessary data in order to carry out the required tasks d. seek out additional information where there are gaps or deficiencies in the information obtained e. deal with or report any problems found with the data and documentation f. make valid decisions based on the evaluation of the engineering information extracted from the documents g. return all documents to the approved location on completion of the work h. complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation
1.3	correctly identify, interpret and extract the required information
1.4	extract information that includes three of the following: <ol style="list-style-type: none"> a. materials or components required b. dimensions c. tolerances d. build quality e. installation requirements f. customer requirements g. time scales h. financial information i. operating parameters j. surface texture requirements k. location/orientation of parts l. process or treatments required m. dismantling/assembly sequence n. inspection/testing requirements o. number/volumes required p. repair/service methods

- q. method of manufacture
 - r. weld type and size
 - s. operations required
 - t. connections to be made
 - u. surface finish required
 - v. shape or profiles
 - w. fault finding procedures
 - x. safety/risk factors
 - y. environmental controls
 - z. specific data (such as component data, maintenance data, electrical data, fluid data)
 - aa. resources (such as tools, equipment, personnel)
 - bb. utility supply details (such as electricity, water, gas, air)
 - cc. location of services, including standby and emergency backup systems
 - dd. circuit characteristics (such as pressure, flow, current, voltage, speed)
 - ee. protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)
 - ff. other specific related information
- 1.5 use the information obtained to ensure that work output meets the specification
- 1.6 use information extracted from documents to include one from the following:
- a. drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)
 - b. diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams)
 - c. manufacturers manuals/drawings
 - d. approved sketches
 - e. technical illustrations
 - f. photographic representations
 - g. visual display screen information
 - h. technical sales/marketing documentation
 - i. contractual documentation
 - j. other specific drawings/documents
- 1.7 use information extracted from related documentation, to include two from the following:
- a. instructions (such as job instructions, drawing instructions, manufacturers instructions)
 - b. specifications (such as material, finish, process, contractual, calibration)
 - c. reference materials (such as manuals, tables, charts, guides, notes)
 - d. schedules
 - e. operation sheets
 - f. service/test information
 - g. planning documentation
 - h. quality control documents
 - i. company specific technical instructions
 - j. national, international and organisational standards

<ul style="list-style-type: none"> k. health and safety standards relating to the activity (such as COSHH) l. other specific related documentation
1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved
1.9 report any inaccuracies or discrepancies in documentation and specifications.

Learning outcome	The learner will:
2.	know how to use and interpret engineering data and documentation
Assessment criteria	
The learner can:	
2.1	explain what information sources are used for the data and documentation that they use in their work activities
2.2	explain how documents are obtained, and how to check that they are current and valid
2.3	explain the basic principles of confidentiality (including what information should be available and to whom)
2.4	describe the different ways/formats that data and documentation can be presented (such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information)
2.5	explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation)
2.6	describe the importance of differentiating fact from opinion when reviewing data and documentation
2.7	describe the importance of analysing all available data and documentation before decisions are made
2.8	describe the different ways of storing and organising data and documentation to ensure easy access
2.9	describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents
2.10	describe the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done
2.11	explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work
2.12	explain the importance of returning documents to the designated location on completion of the work activities
2.13	explain what basic drawing conventions are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)
2.14	explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)
2.15	explain the imperial and metric systems of measurement; tolerancing and fixed reference points

- 2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)
- 2.17 describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve.

Unit 303

Working efficiently and effectively in engineering

UAN:	K/601/5055
Level:	3
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from SEMTA national occupational standard: Working efficiently and effectively in engineering (Suite 3).
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition.</p> <p>On completion of the engineering activity, the learner will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.</p> <p>In order to be efficient and effective in the workplace, the learner will also be required to demonstrate that they can create and maintain effective working relationships with colleagues and line management. The learner will also be expected to review</p>

objectives and targets for their personal development and make recommendations to, and communicate any opportunities for, improvements that could be made to working practices and procedures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, or the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to working efficiently and effectively in an engineering environment. The learner will understand the need to work efficiently and effectively, and will know about the areas they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

The learner will understand the safety precautions required when carrying out engineering activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome	The learner will:
1. work efficiently and effectively in engineering	
Assessment criteria	
<p>The learner can:</p> <ol style="list-style-type: none"> 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the work area to carry out the engineering activity 1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken: <ol style="list-style-type: none"> a. the work area is free from hazards and is suitably prepared for the activities to be undertaken b. any required safety procedures are implemented c. any necessary personal protection equipment is obtained and is in a usable condition d. tools and equipment required are obtained and checked that they are in a safe and useable condition e. all necessary drawings, specifications and associated documentation is obtained f. job instructions are obtained and understood g. the correct materials or components are obtained h. storage arrangements for work are appropriate i. appropriate authorisation to carry out the work is obtained 1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements 1.5 ensure that completed products or resources are stored in the appropriate location on completion of the activities 1.6 complete work activities, to include all of the following: <ol style="list-style-type: none"> a. completing all necessary documentation accurately and legibly b. returning tools and equipment c. returning drawings and work instructions d. identifying, where appropriate, any unusable tools, equipment or components e. arranging for disposal of waste materials 1.7 tidy up the work area on completion of the engineering activity 1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.9 deal with problems affecting the engineering process, to include two of the following: <ol style="list-style-type: none"> a. materials b. tools and equipment c. drawings d. job specification e. quality f. people g. timescales h. safety i. activities or procedures 1.10 contribute to and communicate opportunities for improvement to working practices and procedures 	

- 1.11 make recommendations for improving to two of the following:
 - a. working practices
 - b. working methods
 - c. quality
 - d. safety
 - e. tools and equipment
 - f. supplier relationships
 - g. internal communication
 - h. customer service
 - i. training and development
 - j. teamwork
 - k. other
- 1.12 maintain effective working relationships with colleagues to include two of the following:
 - a. colleagues within own working group
 - b. colleagues outside normal working group
 - c. line management
 - d. external contacts
- 1.13 review personal training and development as appropriate to the job role
- 1.14 review personal development objectives and targets to include one of the following:
 - a. dual or multi-skilling
 - b. training on new equipment / technology
 - c. increased responsibility
 - d. understanding of company working practices, procedures, plans and policies
 - e. other specific requirements.

Learning outcome	The learner will:
2.	know how to work efficiently and effectively in engineering
Assessment criteria	
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 describe the safe working practices and procedures to be followed whilst preparing and tidying up their work area 2.2 describe the correct use of any equipment used to protect the health and safety of themselves and their colleagues 2.3 describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity 2.4 describe the action that should be taken if documentation received is incomplete and/or incorrect 2.5 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity 2.6 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity 2.7 describe the action that should be taken if tools and equipment are not in full working order 2.8 describe the checks to be carried out to ensure that all materials required are correct and complete, prior to undertaking the activity 2.9 describe the action that should be taken if materials do not meet the requirements of the activity 2.10 explain whom to inform when the work activity has been completed 2.11 describe the information and/or documentation required to confirm that the activity has been completed 2.12 explain what materials, equipment and tools can be reused 2.13 explain how any waste materials and/or products are transferred, stored and disposed of 2.14 explain where tools and equipment should be stored and located 2.15 describe the importance of making recommendations for improving working practices 2.16 describe the procedure and format for making suggestions for improvements 2.17 describe the benefits to organisations if improvements can be identified 2.18 describe the importance of maintaining effective working relationships within the workplace 2.19 describe the procedures to deal with and report any problems that can affect working relationships 2.20 describe the difficulties that can occur in working relationships 2.21 describe the regulations that affect how they should be treated at work (such as equal opportunities act, race and sex discrimination, working time directive) 2.22 describe the benefits of continuous personal development 2.23 describe the training opportunities that are available in the workplace 2.24 describe the importance of reviewing their training and development 2.25 explain with whom to discuss training and development issues 2.26 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve. 	

Unit 304

Welding materials by the manual metal arc process

UAN:	F/504/9170
Level:	3
Credit value:	175
GLH:	322
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 4: Welding Materials by the Manual Metal Arc Process (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual metal arc welding (MMA) equipment in accordance with approved welding procedures. The learner will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment the learner will need to connect all the required leads/cables, electrode holder and workpiece earthing arrangements ready for use, and set and adjust the welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that they cannot resolve, or are outside their permitted authority, to the relevant person. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.</p>

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying welding procedures and instructions. The learner will understand the manual metal-arc welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld materials by the manual metal arc process
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 make the joints as specified using the appropriate thermal joining technique 1.6 set up, check, adjust and use manual metal-arc welding and related equipment to include either: a. alternating current equipment (AC) b. direct current equipment (DC) 1.7 produce welded joints which incorporate both: a. butt welds b. fillet welds 1.8 weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions: a. vertical upwards (PF) butt weld and four other positions chosen from: a. flat (PA) b. horizontal (PC) c. overhead (PE) d. horizontal vertical (PB) e. vertical downwards (PG) f. inclined tube/pipe (H-LO45 or J-LO45) 1.9 use two types and two sizes of electrode from the following:

<ul style="list-style-type: none"> a. rutile b. basic c. nickel alloy d. cellulosic e. stainless steel f. other electrodes
<p>1.10 produce joints in two forms of specified materials from different material groups to include the following:</p> <ul style="list-style-type: none"> a. plate b. section c. pipe/tube d. other forms
<p>1.11 produce joints of the required quality and of specified dimensional accuracy which:</p> <ul style="list-style-type: none"> a. achieve a weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium, EN30042/ISO10042 applies) b. meet the required dimensional accuracy within specified tolerances
<p>1.12 shut down the equipment to a safe condition on completion of joining activities</p>
<p>1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures</p>
<p>1.14 deal promptly and effectively with problems within their control and report those that cannot be solved</p>

<p>Learning outcome</p>
<p>The learner will:</p> <ul style="list-style-type: none"> 2. know how to weld materials by the manual metal arc process
<p>Assessment criteria</p>
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 explain the safe working practices and procedures to be observed when working with MMA welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from effects of the arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials) 2.2 describe the hazards associated with MMA welding and how they can be minimised (live electrical components; poor earthing; the electric arc; fumes and gases; spatter; hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces) 2.3 explain the principles of MMA welding, the equipment and its operation (fusion welding principles, characteristics of the metal arc, ac and dc power sources, typical equipment and power ranges, care of equipment, terminology used in welding) 2.4 explain how to extract the information required from the drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure)

- specification) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken
- 2.5 explain the types and classification of electrodes (flux coverings, correct control, storage and drying of electrodes)
 - 2.6 describe types and features of welded joints in plate, tube and sections (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
 - 2.7 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
 - 2.8 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs/fixtures; manipulators and positioners, tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
 - 2.9 explain how to set up the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters, care and maintenance of equipment)
 - 2.10 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of electrode, safe closing down of the welding equipment)
 - 2.11 describe the organisational quality systems used and weld standards to be achieved
 - 2.12 explain the weld inspection and test procedures used including destructive and non-destructive methods
 - 2.13 explain the personal approval tests and their applicability to their work
 - 2.14 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve

Unit 305

Welding materials by the semi-automatic MIG/MAG and flux cored arc processes

UAN:	J/504/9171
Level:	3
Credit value:	175
GLH:	322
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 5: Welding Materials by the Semi-Automatic MIG/MAG and Flux Cored Arc Processes (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to prepare and operate semi-automatic MIG, MAG and flux cored wire arc welding equipment in accordance with approved welding procedures. The learner will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment the learner will need to connect all the required leads/cables, hoses, shielding gas supply and wire feed mechanisms ready for use, and set and adjust the welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that they cannot resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that</p>

they produce.

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying welding procedures and instructions. The learner will understand the MIG, MAG or flux cored wire welding process used, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld materials by the semi-automatic MIG/MAG and flux cored arc processes
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 make the joints as specified using the appropriate thermal joining technique 1.6 set up, check, adjust and use welding and related equipment for one of the following welding processes: a. MIG b. MAG c. flux cored wire 1.7 produce welded joints which incorporate both of the following: a. butt welds b. fillet welds 1.8 weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions: a. vertical upwards (PF) butt weld and four other positions chosen from: a. flat (PA)

- b. horizontal (PC)
 - c. overhead (PE)
 - d. horizontal vertical (PB)
 - e. vertical downwards (PG)
 - f. inclined pipe/tube (H-LO 45 or J-LO45)
- 1.9 use consumables appropriate to the material and application to include both of the following:
- a. two wire types and sizes from different material groups
 - b. two different shielding gases (where applicable)
- 1.10 produce joints in two forms of specified materials from different material groups to include the following:
- a. plate
 - b. section
 - c. sheet (<3mm)
 - d. pipe/tube
 - e. other forms
- 1.11 produce joints of the required quality and of specified dimensional accuracy which:
- a. achieve a weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium EN 30042/ISO 10042 applies)
 - b. meet the required dimensional accuracy within specified tolerances
- 1.12 shut down the equipment to a safe condition on completion of joining activities
- 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
- 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved

<p>Learning outcome</p> <p>The learner will:</p> <p>2. know how to weld materials by the semi-automatic MIG/MAG and flux cored arc processes</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>2.1 explain the safe working practices and procedures to be observed when working with MIG, MAG or flux cored wire welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials)</p> <p>2.2 describe the hazards associated with arc welding and explain how they can be minimised (live electrical components, poor earthing, the electric arc, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)</p> <p>2.3 explain how to handle and store gas cylinders safely and correctly, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)</p> <p>2.4 explain the principles of MIG, MAG, or flux cored wire arc welding, the equipment and its operation (fusion welding principles, characteristics of the metal arc, power sources, typical equipment and power ranges, care of equipment, control systems, filler wires, gas supply and control, terminology used in welding)</p> <p>2.5 explain how to extract the information required from the drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken</p> <p>2.6 explain the types and classification of consumables (wires, shielding gases -inert and active; control and storage of consumables)</p> <p>2.7 describe the types and features of welded joints in plate, sheet and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)</p> <p>2.8 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)</p> <p>2.9 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (edge preparation; correct joint set-up; cleanliness of materials used; use of jigs/fixtures, manipulators and positioners; tack welding, size and spacing in relationship to material thickness and component size; use of temporary attachments; pre-setting)</p> <p>2.10 explain how to setup the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical</p>

connections, power return and earthing arrangements; wire feed mechanisms; gas supply; equipment calibration; setting welding parameters; care and maintenance of equipment)

- 2.11 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters; correct manipulation of the welding gun; safe closing down of the welding equipment)
- 2.12 describe the organisational quality systems used and weld standards to be achieved
- 2.13 explain the weld inspection and test procedures used including destructive and non-destructive methods
- 2.14 explain the personal approval tests and their applicability to their work
- 2.15 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve

Unit 306

Welding materials by the manual TIG and plasma arc welding process

UAN:	L/504/9172
Level:	3
Credit value:	175
GLH:	322
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 6: Welding Materials by the Manual TIG and Plasma Arc Welding Process (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual TIG or Plasma Arc welding equipment in accordance with approved welding procedures. The learner will be required to set up and check the welding equipment and associated workholding and manipulating devices required. In setting up the equipment the learner will need to connect all the required leads/cables, hoses and torch ready for use, and set and adjust the welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that they cannot resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.</p>

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying welding procedures and instructions. The learner will understand the TIG or Plasma Arc welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld materials by the manual TIG and plasma arc welding process
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 make the joints as specified using the appropriate thermal joining technique 1.6 set up, check, adjust and use welding and related equipment for one of the following manual welding processes: a. TIG b. plasma-arc 1.7 produce welded joints which incorporate the following: a. butt welds and either a. fillet welds or a. welds made autogenously (without filler wire) 1.8 weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions: a. vertical upwards (PF) butt weld and four other positions chosen from: a. flat (PA) b. horizontal (PC)

- c. overhead (PE)
 - d. horizontal vertical (PB)
 - e. vertical downwards (PG)
 - f. inclined pipe/tube (H-LO45 or J-LO45)
- 1.9 use consumables appropriate to the material, application and electrodes to include both of the following:
- a. two different sizes of electrode
 - b. two types of filler wire from different material groups
- 1.10 produce joints in two forms of specified materials from different material groups to include the following:
- a. plate
 - b. section
 - c. sheet
 - d. pipe/tube
 - e. other specific forms
- 1.11 produce joints of the required quality and of specified dimensional accuracy which:
- a. achieve a weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium EN 30042/ISO 10042 applies)
 - b. meet the required dimensional accuracy within specified tolerances
- 1.12 shut down the equipment to a safe condition on completion of joining activities
- 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
- 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved

Learning outcome
The learner will: 2. know how to weld materials by the manual TIG and plasma arc welding process
Assessment criteria
The learner can: 2.1 explain the safe working practices and procedures to be observed when working with TIG or plasma-arc welding equipment (general workshop and site safety, appropriate personal protective equipment (PPE), fire prevention, protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials) 2.2 describe the hazards associated with arc welding and explain how they can be minimised (live electrical components, poor earthing, the electric arc, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces) 2.3 explain how to handle and store gas cylinders safely and correctly, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.4 explain the principles of TIG or plasma-arc welding, the equipment and its operation (fusion welding principles, characteristics of the arc, power sources, typical equipment and power ranges, care of equipment, control systems, filler wires, gas supply and control, terminology used in welding) 2.5 explain how to extract information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken 2.6 explain the types and classification of consumables (wires, shielding gasses, electrodes; control and storage of consumables) 2.7 describe the types and features of welded joints in plate and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality) 2.8 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention) 2.9 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs/fixtures; manipulators and positioners, tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting) 2.10 explain how to setup the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; gas supply,

equipment calibration, setting welding parameters, care and maintenance of equipment)

- 2.11 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of torch, safe closing down of the welding equipment)
- 2.12 describe the organisational quality systems used and weld standards to be achieved
- 2.13 explain the weld inspection and test procedures used including destructive and non-destructive methods
- 2.14 explain the personal approval tests and their applicability to their work
- 2.15 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve

Unit 307

Welding materials by the manual oxy/fuel gas welding process

UAN:	R/504/9173
Level:	3
Credit value:	170
GLH:	308
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 6: Welding Materials by the Manual TIG and Plasma Arc Welding Process (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual oxy/fuel gas welding equipment in accordance with approved welding procedures. The learner will be required to set up and check the welding equipment and associated work holding and manipulating devices required. In setting up the equipment the learner will need to connect all the required regulators/gauges, flashback arrestors, hoses and welding torch ready for use, and set and adjust the gas pressures/welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with the welding equipment or welding activities that they cannot resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that</p>

they produce.

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying welding procedures and instructions. The learner will understand the gas welding process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld materials by the manual oxy/fuel gas welding process
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 set up, check, adjust and use oxy/fuel gas welding and related equipment to include all of the following: a. correct handling and storage of cylinders b. connecting regulators, hoses and valves c. connecting the welding torch and selecting and fitting the correct size nozzle d. fitting a flash back arrestor e. setting appropriate gas pressures f. using the correct procedure for lighting, adjusting and extinguishing the welding flame 1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 produce welded joints which incorporates the following: a. butt welds and either a. fillet welds or a. welds made autogenously (without filler wire)

- 1.8 weld joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:
 - a. vertical upwards (PF) butt weld
 and four other positions chosen from:
 - a. flat (PA)
 - b. horizontal (PC)
 - c. overhead (PE)
 - d. horizontal vertical (PB)
 - e. vertical downwards (PG)
 - f. inclined pipe/tube (H-LO45 or J-LO45)
- 1.9 use a range of filler wire to include:
 - a. two different sizes
 - b. two different filler wire properties/composition
- 1.10 produce joints in two forms of specified materials from different material groups to include the following:
 - a. plate
 - b. section
 - c. sheet (<3mm)
 - d. pipe/tube
 - e. other specific forms
- 1.11 produce joints of the required quality and of specified dimensional accuracy which:
 - a. achieve a minimum weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium EN30042/ISO10042 applies)
 - b. meet the required dimensional accuracy within specified tolerances
- 1.12 shut down the equipment to a safe condition on completion of joining activities
- 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures
- 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved

Learning outcome
The learner will: 2. know how to weld materials by the manual oxy/fuel gas welding process
Assessment criteria
The learner can: 2.1 explain the safe working practices and procedures to be observed when working with gas welding equipment (general workshop and site safety; cylinder handling and storage; appropriate personal protective equipment (PPE); fire and explosion prevention; protecting other workers; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements; risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials) 2.2 describe the hazards associated with gas welding and explain how

- they can be minimised (high pressure cylinders and gas supply systems; naked flames; fumes and gases; explosive gas mixtures; oxygen enrichment; spatter; hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces)
- 2.3 explain how to handle and store gas cylinders safely and correctly, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)
 - 2.4 explain the principles of oxy/fuel gas welding, the equipment and its operation (gas welding principles, supply of compressed gases, characteristics of welding flames, typical equipment, care of equipment, terminology used in gas welding)
 - 2.5 explain how to extract information required from drawings and welding procedure specifications (interpretation of welding symbols; scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken
 - 2.6 explain the types and classification of filler rods and fluxes; control and storage of consumables
 - 2.7 describe the types and features of welded joints in sheet, plate and tube (fillet and butt welds, single and multi-run welds, welding positions, weld quality)
 - 2.8 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
 - 2.9 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (correct joint set-up; cleanliness of materials used; edge preparation; use of jigs/fixtures, manipulators and positioners; tack welding, size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
 - 2.10 explain how to setup the welding equipment and checks that need to be made to ensure that it is safe and ready to use (connection of hoses, torch, flash-back arrestors, hose check valves and regulators; checking connections for leaks; setting welding parameters)
 - 2.11 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (selection of nozzle, application of flux, manipulation of torch and filler rods, safe closing down of the welding equipment)
 - 2.12 describe the organisational quality systems used and weld standards to be achieved
 - 2.13 explain the weld inspection and test procedures used including destructive and non-destructive methods
 - 2.14 explain the personal approval tests and their applicability to their work
 - 2.15 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve

Unit 308

Welding pipe/tube using multiple manual arc welding processes

UAN:	Y/504/9174
Level:	3
Credit value:	180
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 8: Welding Pipe/Tube using Multiple Manual Arc Welding Processes (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to produce full penetration butt welds in pipe or tube using manual welding processes such as manual metal arc (MMA), MIG, MAG, TIG, Plasma arc or cored wire welding equipment in accordance with instructions and/or approved welding procedures. It covers the use of multiple welding processes such as root TIG and fill with MMA or MMA root and flux core fill. The learner will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. The learner will be expected to set up the welding equipment ensuring that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld the learner will need to set and adjust the welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with</p>

the welding equipment or welding activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying welding procedures and instructions. The learner will understand the welding process used and its application, and will know about the equipment, materials and consumables used in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld pipe/tube using multiple manual arc welding processes
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 make the joints as specified using the appropriate thermal joining technique 1.6 set up, check, adjust and use welding and related equipment for two or more of the following welding processes: a. manual metal arc b. MIG/MAG c. TIG d. plasma arc e. cored wire 1.7 produce full penetration butt joints in both of the following: a. small bore pipe / tube (50mm diameter or less)

<ul style="list-style-type: none"> b. large bore pipe / tube (above 50mm diameter)
<p>1.8 weld butt joints according to approved welding procedures in good access situations in the following BS EN ISO 6947 positions:</p> <ul style="list-style-type: none"> a. inclined (H-LO 45 or J-LO 45) <p>and three other positions chosen from:</p> <ul style="list-style-type: none"> a. flat (PA) rotating b. horizontal (PC) c. vertical Upwards (PF) d. vertical Downwards (PG)
<p>1.9 use consumables specified in the welding procedure specification for the following:</p> <ul style="list-style-type: none"> a. the root run(s) b. the fill and capping runs
<p>1.10 produce joints of the required quality and of specified dimensional accuracy which:</p> <ul style="list-style-type: none"> a. achieve a minimum weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium EN30042/ISO10042 applies) b. meet the required dimensional accuracy within specified tolerance
<p>1.11 shut down the equipment to a safe condition on completion of joining activities</p>
<p>1.12 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures</p>
<p>1.13 deal promptly and effectively with problems within their control and report those that cannot be solved</p>

<p>Learning outcome</p>
<p>The learner will:</p> <ul style="list-style-type: none"> 2. know how to weld pipe/tube using multiple manual arc welding processes
<p>Assessment criteria</p>
<p>The learner can:</p> <ul style="list-style-type: none"> 2.1 explain the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials) 2.2 explain how to handle and store gas cylinders safely and correctly, (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.3 describe the hazards associated with the selected welding process and how they can be minimised (live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal; grinding and mechanical metal/slag removal;

- elevated working; enclosed spaces; slips, trips and falls)
- 2.4 explain the manual welding process selected and describe the different types of welding equipment (basic principles of fusion welding, ac and dc power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
 - 2.5 explain how to extract information required from drawings and welding procedure specifications (interpretation of welding symbols, scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken
 - 2.6 describe the consumables associated with the chosen welding process (types of electrodes and or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
 - 2.7 describe the types and features of welded joints in plate, fillet and butt welds (single and multi-run welds, welding positions, weld quality)
 - 2.8 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
 - 2.9 explain how to prepare the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters)
 - 2.10 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)
 - 2.11 explain the importance of complying with job instructions and the welding procedure specification
 - 2.12 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
 - 2.13 describe the organisational quality systems used and weld standards to be achieved, weld inspection and test procedures used including visual and non-destructive tests
 - 2.14 explain the personal approval tests and their applicability to their work
 - 2.15 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve

Unit 309

Welding plate using multiple manual arc welding processes

UAN:	H/504/9176
Level:	3
Credit value:	180
GLH:	329
Relationship to NOS:	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 9: Welding Plate using Multiple Manual Arc Welding Processes (Suite 3)
Assessment requirements specified by a sector or regulatory body:	This unit is endorsed by SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to produce full penetration butt welds in plate or section materials using multiple manual welding processes such as manual metal arc (MMA), MIG, MAG, TIG, Plasma or cored wire welding equipment in accordance with instructions and/or approved welding procedures. The learner will be expected to produce welds using two or more welding processes such as root TIG and fill with MMA or MMA root and flux core fill. The learner will be required to check that all the workholding equipment and manipulating devices required are available and in a usable condition. The learner will be expected to set up the welding equipment ensuring that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld the learner will need to set and adjust the welding conditions in line with the welding procedure specification. The learner must operate the equipment safely and correctly and make any necessary adjustments to settings in order to produce the welded joints to the required specification.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken and to report any problems with</p>

the welding equipment or welding activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying multiple welding procedures and instructions. The learner will understand the welding processes used and their application, and will know about the equipment, materials and consumables used in adequate depth to provide a sound basis for setting up and operating the equipment, recognising and correcting faults and ensuring the work output is produced to the required specification. Visual inspection and non-destructive testing of their completed work is implied.

The learner will understand the safety precautions required when working with the welding equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. weld plate using multiple manual arc welding processes
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 make the joints as specified using the appropriate thermal joining technique 1.6 set up, check, adjust and use welding and related equipment for two or more of the following welding processes: a. manual metal arc b. MIG/MAG c. TIG d. plasma arc e. cored wire 1.7 weld butt joints according to approved welding procedures in good

<p>access situations in the following BS EN ISO 6947 positions:</p> <ul style="list-style-type: none"> a. vertical upwards (PF) <p>and four other positions chosen from:</p> <ul style="list-style-type: none"> a. flat (PA) b. horizontal (PC) c. horizontal Vertical (PB) d. vertical Downwards (PG) e. overhead (PE or PD) <p>1.8 use consumables specified in the welding procedure specification for the following:</p> <ul style="list-style-type: none"> a. the root run(s) b. the fill and capping runs <p>1.9 produce full penetration butt joints in one the following types of material:</p> <ul style="list-style-type: none"> a. carbon range of steel plate b. stainless plate c. non-ferrous plate <p>1.10 produce joints of the required quality and of specified dimensional accuracy which:</p> <ul style="list-style-type: none"> a. achieve a minimum weld quality equivalent to Level B of BS EN ISO 5817 except for excess weld metal, excessive convexity, excess throat thickness and excessive penetration for which Level C shall apply (for aluminium EN30042/ISO10042 applies) b. meet the required dimensional accuracy within specified tolerance <p>1.11 shut down the equipment to a safe condition on completion of joining activities</p> <p>1.12 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures</p> <p>1.13 deal promptly and effectively with problems within their control and report those that cannot be solved</p>

<p>Learning outcome</p> <p>The learner will:</p> <ul style="list-style-type: none"> 2. know how to weld plate using multiple manual arc welding processes
<p>Assessment criteria</p> <p>The learner can:</p> <ul style="list-style-type: none"> 2.1 explain the safe working practices and procedures to be observed when working with the selected welding equipment (general workshop and site safety; appropriate personal protective equipment (PPE); fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume control; accident procedure; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and work equipment regulations; safe disposal of waste materials) 2.2 describe the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.3 describe the hazards associated with the selected welding process

- and explain how they can be minimised (live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls)
- 2.4 explain the manual welding process selected and describe the different types of welding equipment (basic principles of fusion welding, ac and dc power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)
 - 2.5 explain how to extract information required from the drawings and welding procedure specifications (interpretation of welding symbols, scope, content and application of the welding procedure specification such as preheat) to include symbols and conventions to appropriate British, European or relevant international standards in relation to work undertaken
 - 2.6 describe the consumables associated with the chosen welding process (types of electrodes and or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire)
 - 2.7 describe the types and features of welded joints in plate, fillet and butt welds (single and multi-run welds, welding positions, weld quality)
 - 2.8 explain the methods used to set up and restrain the joint to achieve correct location of components and control of distortion (edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting)
 - 2.9 explain how to prepare the welding equipment and checks that need to be made to ensure that it is safe and ready to use (electrical connections, power return and earthing arrangements; equipment calibration, setting welding parameters)
 - 2.10 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)
 - 2.11 explain the importance of complying with job instructions and the welding procedure specification
 - 2.12 describe the problems that can occur with the welding activities and explain how these can be overcome (causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention)
 - 2.13 describe the organisational quality systems used and weld standards to be achieved, weld inspection and test procedures used including visual and non-destructive tests
 - 2.14 explain the personal approval tests and their applicability to their work
 - 2.15 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve



Appendix 1 Relationships to other qualifications

Links to other qualifications

Mapping is provided as guidance and suggests areas of commonality between the qualifications. It does not imply that candidates completing units in one qualification have automatically covered all of the content of another.

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

This qualification has connections to the:

- Level 3 NVQ Diploma in Fabrication and Welding (1781-30-36)
- Level 3 NVQ Extended Diploma in Fabrication and Welding (1782-60)

Literacy, language, numeracy and ICT skills development

This qualification 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 (from September 2010).



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.

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
- **Qualifications and Credit Framework (QCF):** general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for GOLA/e-volve assessments.

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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, GOLA/e-volve, 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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