

COMPETENCY STANDARDS FOR

WELDER

Unit No	Unit Title
1.	Perform spot welding
2.	Perform soldering and brazing
3.	Weld steel / aluminum plates by Oxy Acetylene welding In 1F,2F,1G and 2G positions
4.	Weld steel/aluminum plates by Oxy Acetylene welding In 3F,4F,3G and 4G positions
5.	Perform metal spraying and hard facing
6.	Weld metal by submerged arc welding process
7.	Cut metal by plasma cutting process
8.	Plan and prepare estimates for welding

UNIT TITLE	Perform spot welding				
DESCRIPTOR	This unit covers the competencies required to perform spot welding on metal sheets/meshes of different thicknesses ensuring safe work practices in the use of related machinery, material and equipment.				
CODE	CON02S2U01V1	Level	2	Credit	4

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cum material to size to suit the job	1.1. Required material for the job selected according to specifications 1.2. Measurements marked accurately on selected material according to drawings 1.3. Material cut according to measurements for the job
2. Prepare joint surfaces for welding	2.1. Joint surfaces prepared, according to specifications 2.2. Joint surfaces of metal, filed/ground or evened out by suitable means, to suit specifications 2.3. Metal surfaces, prepared cleaned as required for welding
3. Tack weld the metal pieces	3.1. Parts for welding secured by using clamps, and checked with drawing for accuracy 3.2. Work pieces aligned and clamped to suit specifications
4. Weld thin sheets	4.1. Spot welding equipment arranged as required for the welding job, fixing suitable electrodes and other accessories 4.2. Current, time and pressure to be applied, set according to requirements 4.3. Thin sheets spot welded to meet the required standards
5. Weld thin wire mesh	5.1. Spot welding equipment arranged as required for the welding job, fixing suitable electrodes and other accessories 5.2. Current, time and pressure to be applied, set according to requirements 5.3. Work pieces clamped, according to required

	specifications
5.4.	Wire mesh spot welded according to required standards

RANGE STATEMENT

Work connected to this unit may take place in a welding / training workshop or in a worksite.

Tools, equipment and material used in this unit may include

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Hack saw & power saw
- Hand drill, pillar drill, and pedestal grinder
- Gas cutting equipment including the profile cutter
- Disc grinder
- Safety gear and equipment
- Spot welding machine and related accessories and electrodes
- Clamps
- Cleaning tools
- Mild steel, Stainless steel, Aluminium sheets less than 3mm thickness
- Mild steel, stainless steel wiremesh less than 3mm thickness

Work is performed according to drawings, sketches, specifications and instructions as appropriate, and to predetermined standards of quality and safety, while observing all relevant environmental regulations.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organization (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment / holistic assessment is suitable to assess the competencies in the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- The candidate should spot weld without damaging tools and equipment used, ensuring safety of him/her self and safety of others.
- The welded joint should be free of over burnt spots, lack of fusion, deep impressions.

Assessment condition

The candidate shall have access to:

- All tools, equipment, material and documentation required.

The candidate shall be permitted to refer to the following documents:

- Any relevant workplace procedures.
- Any relevant product manufacturing specifications.
- Any relevant drawings, manuals, codes, standards and reference material.

The candidate shall be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit, for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

Spot welded joints shall be tested by;

- Destructive tests to test the
 - Tensile strength

Special notes

During assessment, the candidate shall:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved shall be completed within reasonable time frames, relating to typical workplace activities.

Resources required for assessment include: Material, tools, equipment and machines listed within this unit

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none">• Types of measuring and marking tools and their uses• Hand tools; cutting, drilling, grinding and hack sawing machines• Properties of metals• Hacksaw and power saw blades• Types of files and the principles of filing• Safety precautions and procedures and the use of safety gear• Engineering drawing, projections & pattern development including welding symbols• Current ranges used in spot welding• Time ranges used in resistance	<ul style="list-style-type: none">• Reading & interpretation of drawings• Marking out procedures• Care & maintenance of tools & equipment• Cutting techniques• Use of hand tools• Selection of files & filing techniques• Operation of the spot welding / resistance welding machine• Spot welding of thin wire and sheets of less than 3mm thickness• Ability to prepare an engineering drawing including it's projections & pattern development• Follow safety procedures and handle

welding according to plate thickness and current	safety gear
<ul style="list-style-type: none">• Pressure applied to different thicknesses of material• Identification of the gauges of wire and sheet gauges• Spot welding techniques	

UNIT TITLE	Perform soldering and brazing				
DESCRIPTOR	This unit covers the competencies required to perform soldering and brazing of ferrous and non-ferrous metals, using non ferrous solders and brazing alloys, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CON02S2U08V1	Level	2	Credit	4

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Prepare the job for Soldering / Brazing	1.1. Solderability of the parts to be joined ascertained 1.2. Material required for the job, selected according to specifications 1.3. Material cut, to required sizes for soldering/brazing
2. Prepare the edges and surfaces to be joined	2.1. Soldering/Brazing joints/surfaces prepared according to specification 2.2. Surfaces/edges de-rusted and cleaned thoroughly by sanding/filing /scraping/chemical applications
3. Prepare for Soldering / Brazing	3.1. Suitable heating device selected, as appropriate for the job 3.2. Suitable solder / brazing alloys and flux selected to suit the metal to be joined 3.3. Flux applied on the surfaces to be joined 3.4. Parts to be soldered aligned and secured using suitable clamping devices
4. Solder metal parts	4.1. Wetting process carried out to ease soldering 4.2. Soldering performed to the required specification 4.3. Soldered joint cleaned as necessary 4.4. Necessary repairs made to ensure the required quality
5. Braze Metal parts	5.1. Wetting process carried out to ease brazing 5.2. Brazing performed to the required specification, and taking care of distortions 5.3. Brazed joint cleaned as necessary

	5.4. Necessary repairs made to ensure the required quality
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RANGE STATEMENT

Work connected to this unit may take place in a welding/ training workshop or worksite. It shall include soldering/brazing of all kinds of metals using non-ferrous solders/ brazing alloys of various compositions.

Tools, equipment and material used may include;

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Pedestal grinder
- Gas cutting equipment including the profile cutter
- Sanding papers
- Safety gear and equipment
- Soldering iron
- Soldering torch
- Blow lamp
- Gas welding equipment
- Clamps and other clamping devices
- Ferrous and non-ferrous metals
- Soldering and brazing fluxes
- Different types solders and spelters (soldering brazing alloys)

Work shall be performed to drawings, sketches, specifications and instructions, as appropriate and to predetermined standards of quality, safety and adhering to relevant environmental regulations.

Soldered/Brazed joints shall be finished as required by the job specification.

ASSESSMENT GUIDE

Forms of assessment

A holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safety practices at all times. (Special caution when using fluorides fluxes and cadmium solders).
- Ensure the quality of the joint; avoid joints with excess solder, joints with no solder at all, joints with insufficient solder, and flux residue in the joint.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Any relevant workplace procedures.
- Any relevant product manufacturing specifications.
- Any relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The soldered/brazed joints may be tested by;

- Non destructive tests such as the following, to locate cracks or faults
 - Visual tests

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none">• Difference between soldering and welding• Sort soldering/hard soldering process• Soldering and brazing alloys (Filler rods working temperatures and applications)• Type of soldering and brazing fluxes and their uses• Use and control of soldering/brazing Irons, Torches, Blow lamps and Gas welding equipment• Soldering and brazing methods• Defects in soldered joints and corrections• Solderability of material	<ul style="list-style-type: none">• Application of soldering/brazing• Flame setting for brazing when using gas-welding equipment• Cleaning of work pieces for soldering/brazing• Wetting of work surface• Correct use of fluxes and soldering/brazing alloys• Protection from hazardous fumes• Detection of faults by visual means and their corrections• Cleaning and finishing of soldered/brazed work pieces• Follow safety procedures and handle safety gear

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| <ul style="list-style-type: none">• Safety precautions and procedures and the use of safety gear | |
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UNIT TITLE	Weld steel / aluminium plates by Oxy Acetylene welding In 1F,2F,1G and 2G positions				
DESCRIPTOR	This unit covers the competencies required for setting the welding equipment and to perform oxy-acetylene welding of steel / aluminium plates in 1G and 2G positions, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CON02S2U09V1	Level	3	Credit	10

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cut material to required sizes	1.1. Material selected for the job according to specification 1.2. Measurements marked accurately on selected material according to drawings 1.3. Material cut according to measurements in the drawing
2. Prepare weld joints	2.1. Joint prepared according to specifications 2.2. Metal parts cleaned for welding
3. Arrange gas welding equipment	3.1. Gas welding equipment set for safe operation 3.2. Suitable welding nozzle and gas pressure selected according to material thickness 3.3. Suitable welding rods and flux selected for the job as necessary
4. Tack weld the metal pieces	4.1. Parts aligned and secured for welding using clamps to suit specification 4.2. Work pieces tack welded in position
5. Weld steel/aluminium plates, in 1F,2F,1G and 2G positions by oxy-acetylene welding	5.1. Welding torch ignited and adjusted to get the required flame 5.2. Metal plates welded by manipulating the Torch, with correct gap, feed, travel speed and angle using flux as necessary 5.3. Weld checked for continuity evenness, quality and completeness 5.4. Weld joint cleaned as required 5.5. Weld joint checked for defects visually 5.6. Any repairs to the welded joint made as necessary to ensure a quality weld

<p>6. Build up metal by oxy-acetylene welding</p>	<p>6.1. Areas to be built up identified, marked and prepared</p> <p>6.2. Metal built up by manipulating the Torch with correct gap,</p> <p>6.3. bead, travel speed and angle using flux as necessary</p> <p>6.4. Weld built up evenly without high spots</p> <p>6.5. Built up surface cleaned, and evened out as required</p>
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RANGE STATEMENT

Work connected to this unit may take place in a welding / training workshop or worksite. It will include all types of joints including building up.

Tools, equipment and material used may include;

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Hand hack saw & power saw
- Pedestal grinder
- Gas cutting equipment including the profile cutter
- Disc grinder
- Safety gear and equipment
- Welding tool kit (Holding devices, Chipping hammer, Wire brushes)
- Oxygen and acetylene cylinders
- Gas welding equipment
- Steel/aluminium sheets/Plates Thickness up to 6mm)
- Fluxes

Work is performed to drawings, sketches, specifications and instructions, as appropriate and to predetermined standards of quality, safety and adhering to relevant environmental regulations.

Welded joints shall be finished as required by the job specification.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Materials (ASTM)

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment/holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safe practice in all operations.
- Quality of welded joint - Correct bead formation, no lack of fusion, no pores and cracks, correct penetration, no burnt areas.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Any relevant workplace procedures.
- Any relevant product manufacturing specifications.
- Any relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The welded joints may be tested by;

- Destructive tests, to test the
 - Bending stress
 - Hardness
 - Tensile strength
 - Impact nick breaking point
- Non destructive tests such as the following, to locate cracks or flaws
 - Visual tests
 - Magnetic particles
 - Radio graphics
 - Liquid penetrant
 - Ultrasonic

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none"> • Properties of material & heat implications in welding • Gas welding process • Hazards in using gas for welding & safety precautions • Nozzle sizes to suit different thickness of metal • Control of gas input with regulators • Selection and use of different fluxes for welding • Different welding techniques • Identification of welding gases • Welding symbols & specifications according to standards • Destructive and non destructive testing of welds • Welding positions • Types of joints and grooves • Build up techniques • Weld defects and correction • Selection of filler rods • Methods of reducing warping and distortion • Stress relieving • Safety precautions and procedures and the use of safety gear 	<ul style="list-style-type: none"> • Read and interprets sketches / drawings • Application of electric welding equipment for metal welding • Clamping/Holding work pieces • Sequence of lighting the torch • Cleaning, & finishing the weld • Visual testing of welds and correction of defects • Manipulating welding torch with correct speed maintaining, correct angle, weaving speed, feed • Cleaning & finishing the weld as required • Built up surfaces with gas welding • Follow safety procedures and handle safety gear

UNIT TITLE	Weld steel/aluminum plates by Oxy Acetylene welding In 3F,4F,3G and 4G positions				
DESCRIPTOR	This unit covers the competencies required for setting the welding equipment and to perform oxy-acetylene welding of steel/aluminium plates in 3G and 4G positions, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CON02S2U10V1	Level	3	Credit	10

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cut material to required sizes	1.1. Material selected for the job according to specifications 1.2. Drawings interpreted and measurements marked accurately on materials selected 1.3. Material cut according to measurements in the drawing
2. Prepare weld joints	2.1. Joint prepared according to specifications 2.2. Metal parts cleaned for welding
3. Arrange gas welding equipment	3.1. Gas welding equipment set for safe operation 3.2. Suitable welding nozzle and gas pressure selected according to material thickness 3.3. Suitable welding rods and flux selected for the job as necessary
4. Tack weld the metal pieces	4.1. Parts aligned and secured for welding using clamps to suit specification 4.2. Work pieces tack welded, in position
5. Weld steel/aluminium plates, in 3F,4F,3G and 4G positions by oxy-acetylene welding	5.1. Welding torch ignited and adjusted to obtain the required flame 5.2. Metal plates welded by manipulating the Torch, with corrected gap, feed, travel speed and angle using flux as necessary 5.3. Weld checked for continuity evenness, quality and completeness 5.4. Weld joint cleaned as required 5.5. Weld joint checked for defects visually 5.6. Any repairs to the welded joint made as necessary to ensure a quality weld

RANGE STATEMENT

Work connected to this unit may take place in a welding/ training workshop or worksite. It will include all types of joints including building up.

Tools, equipment and material used may include;

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Hand hack saw & power saw
- Pedestal grinder
- Disc grinder
- Gas cutting equipment including the profile cutter
- Safety gear and equipment
- Welding tool kit (Holding devices, Chipping hammer, Wire brushes)
- Oxygen and acetylene cylinders
- Gas welding equipment
- Steel/aluminium sheets/Plates (Thickness up to 6mm)
- Fluxes

Work is performed to drawings, sketches, specifications and instructions as appropriate, and to predetermined standards of quality and safety, and adhering to relevant environmental regulations.

Welded joints shall be finished as required by the job specification.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment/holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safe practice in all operations.
- Quality of welded joint - Correct bead formation, no lack of fusion, no pores and cracks, correct penetration, no burnt areas.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Any relevant workplace procedures.
- Any relevant product manufacturing specifications.
- Any relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The welded joints may be tested by;

- Destructive tests, to test the
 - Bending stress
 - Hardness
 - Tensile strength

- Impact nick breaking point
- Non destructive tests such as the following, to locate cracks or flaws
 - Visual tests
 - Magnetic particles
 - Radio graphics
 - Liquid penetrant
 - Ultrasonic

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
<ul style="list-style-type: none"> • Properties of material & heat implications in welding • Gas welding process • Hazards in using gas for welding & safety precautions • Nozzle sizes to suit different thickness of metal • Control of gas input with regulators 	<ul style="list-style-type: none"> • Read and interprets sketches/drawings • Application of gas welding equipment for metal welding • Adjustment of flame, to suit the metal & material thickness • Welding techniques to get a correct weld

<ul style="list-style-type: none"> • Selection and use of different fluxes for welding • Different welding techniques • Identification of welding gases • Welding symbols & specifications according to standards • Destructive and non destructive testing of welds • Welding positions • Types of joints and grooves • Build up techniques • Weld defects and correction • Selection of filler rods • Methods of reducing warping and distortion • Stress relieving • Safety precautions and procedures and the use of safety gear 	<ul style="list-style-type: none"> • Clamping/Holding work pieces • Sequence of lighting the torch. • Cleaning & finishing the weld as required • Visual testing of welds and correction of defects • Manipulating of welding torch with correct speed maintaining, correct angle, weaving speed, feed • Follow safety procedures and handle safety gear
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UNIT TITLE	Weld steel/aluminum pipes by Oxy Acetylene welding In all positions				
DESCRIPTOR	This unit covers the competencies required for setting the welding equipment and to perform oxy-acetylene welding of steel/aluminum pipes in all positions, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CON02S2U11V1	Level	4	Credit	5

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cut material to required sizes	1.1. Material selected for the job according to specifications 1.2. Drawings interpreted and measurements marked accurately on material selected 1.3. Material cut according to measurements in the drawing
2. Prepare weld joints	2.1. Joint prepared according to specifications 2.2. Metal parts cleaned for welding
3. Arrange gas welding equipment	3.1. Gas welding equipment set for safe operation 3.2. Suitable welding nozzle and gas pressure selected, according to material thickness 3.3. Suitable welding rods and flux selected for the job as necessary
4. Tack weld the metal pieces	4.1. Parts aligned and secured for welding using clamps to suit specification 4.2. Work pieces tack welded
5. Weld steel/aluminum pipes, in all positions by oxy-acetylene welding	5.1. Welding torch ignited and adjusted to obtain the required flame 5.2. Metal pipes welded by manipulating the Torch, with corrected gap, feed, travel speed and angle using flux as necessary 5.3. Weld checked for continuity evenness, quality and completeness 5.4. Weld joint cleaned 5.5. Weld joint checked for defects visually 5.6. Any repairs to the welded joint made as necessary, to ensure a quality weld

RANGE STATEMENT

Work connected to this unit may take place in a welding/ training workshop or worksite. It will include all types of joints including building up.

Tools, equipment and material used may include;

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Hand hack saw & power saw
- Pedestal grinder
- Disc grinder
- Gas cutting equipment including the profile cutter
- Safety gear and equipment
- Welding tool kit (Holding devices, chipping hammer, Wire brushes)
- Oxygen and acetylene cylinders
- Gas welding equipment
- Steel/aluminum Pipes
- Fluxes

Work is performed to drawings, sketches, specifications and instructions as appropriate, and to predetermined standards of quality and safety, and adhering to relevant environmental regulations.

Welded joints shall be finished as required by the job specification.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment/holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safe practice in all operations.
- Quality of welded joint - Correct bead formation, no lack of fusion, no pores and cracks, correct penetration, no burnt areas.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Any relevant workplace procedures.
- Any relevant product manufacturing specifications.
- Any relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The welded joints may be tested by;

- Destructive tests, to test the
 - Bending stress
 - Hardness
 - Tensile strength

- Impact nick breaking point
- Non destructive tests such as the following, to locate cracks or flaws
 - Visual tests
 - Magnetic particles
 - Radio graphics
 - Liquid penetrant
 - Ultrasonic

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none"> • Properties of material & heat implications in welding • Gas welding process • Hazards in using gas for welding & safety precautions • Nozzle sizes to suit different thickness of metal • Control of gas input with regulators 	<ul style="list-style-type: none"> • Read and interprets sketches/drawings • Clamping/Holding work pieces • Sequence of lighting the torch • Application of gas equipment for metal welding • Adjustment of flame to suit the metal & material thickness

<ul style="list-style-type: none"> • Selection and use of different fluxes for welding • Different gas welding techniques • Identification of welding gases • Welding symbols & specifications according to standards • Destructive and non destructive testing of welds • Welding positions • Types of joints and grooves • Pipe welding techniques • Weld defects and correction • Selection of filler rods • Methods of reducing warping and distortion • Stress relieving • Safety precautions and procedures and the use of safety gear 	<ul style="list-style-type: none"> • Welding techniques to get a correct weld • Cleaning, & finishing the weld as required • Visual testing of welds and correction of defects • Manipulating of welding torch with correct speed maintaining, correct angle, weaving speed, feed • Follow safety procedures and handle safety gear
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UNIT TITLE	Perform metal spraying and hard facing				
DESCRIPTOR	This unit covers the competencies required to perform hard facing and metal spraying to build up worn parts, by depositing a harder metal. Usually alloys of steel or complex alloys which are more resistance to wear, impact and corrosion, ensuring safe work practices.				
CODE	CON02S2U23V1	Level	3	Credit	3

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Identify the base metal	1.1. The component to be hard faced/ metal sprayed, thoroughly cleaned by removing oil, grease and other foreign matter 1.2. The type of parent metal ascertained by visual means 1.3. The surface treatment is to be given by surfacing or metallizing, determined
2. Perform surfacing (Hard facing) using oxy-acetylinie process	2.1. The metal surface cleaned and prepared as required for the job 2.2. Suitable welding nozzles, gas pressure and type of flame selected to suit the job 2.3. Work piece clamped for hard facing in the required position 2.4. Suitable filler rods and fluxes selected for the job 2.5. Buffer layer applied with suitable rod as required 2.6. Hard facing filler metal deposited to the buffer layer to required thickness to get the desired properties 2.7. The built up surface slowly cooled down in order to avoid cracking 2.8. The built up surface checked for continuity, evenness and quality 2.9. High spots removed by grinding and the weld cleaned

<p>3. Perform surfacing (Hard facing) using manual arc welding</p>	<p>3.1. The metal surface for Hard facing (surfacing) identified for the job</p> <p>3.2. Component to be hard face secured properly, to avoid warping and distortion</p> <p>3.3. AC/DC arc welding set selected and assembled for safe operation</p> <p>3.4. Suitable welding electrodes for hard facing and filling and polarity, selected to suit the requirement</p> <p>3.5. The surface built up keeping correct gap, travel speed and angle</p> <p>3.6. Adequate runs of weld performed as necessary</p> <p>3.7. The weld checked for continuity, evenness, quality and completeness</p> <p>3.8. The filling ground, levelled and cleaned, as necessary</p>
<p>4. Perform MIG/ MAG surfacing</p>	<p>4.1. The surface prepared as for manual arc welding process</p> <p>4.2. MIG / MAG welding plant set, for safe operation</p> <p>4.3. Suitable welding Holder, filler wire, current contact nozzle, shielding gas and gas flow rate selected</p> <p>4.4. Thin layers applied in order to avoid overheating and dilution</p> <p>4.5. Beads applied cooled down before adding the next layer</p> <p>4.6. The beads leveled up as required after cooling</p>
<p>5. Perform TIG surfacing</p>	<p>5.1. The surface prepared properly by cleaning</p> <p>5.2. TIG welding equipment set for safe operation</p> <p>5.3. The work preheated to the required temperature as specified</p> <p>5.4. Filler rod selected to suit the job</p> <p>5.5. The worn surface built up to the required thickness and cooled down slowly to avoid undue stresses</p> <p>5.6. Heat treatment carried out if specified</p>

<p>6. Perform plasma powder spraying</p>	<p>6.1. The plasma-powder torch set according to specifications</p> <p>6.2. The suitable surfacing powder and gas selected as required for the job</p> <p>6.3. Switched on pilot arc and metal powder preheated</p> <p>6.4. Switched on main arc and the melted powder sprayed to the required thickness and width by manipulating the torch</p> <p>6.5. The surface cooled down slowly</p>
<p>7. Perform metal spraying (metallizing) by oxy-acetylene process</p>	<p>7.1. Surface properly cleaned to get rid of rust and scales</p> <p>7.2. The surface roughened by turning grooves to improve anchoring of the sprayed metal</p> <p>7.3. Oxy-acetylene spray torch connected with flow meters for air and gas pressure regulators, arranged according to specifications</p> <p>7.4. Suitable filler wires/ powder appropriate for the job selected</p> <p>7.5. Thin coats sprayed by proper manipulating the wire/ powder flow rate and gas flame adjustment</p> <p>7.6. The sprayed surface allowed to cool down slowly</p>
<p>8. Perform metal spraying (metallizing) by electric-arc process</p>	<p>8.1. Surface properly cleaned to get rid of oil, grease, rust and scales</p> <p>8.2. Electric-arc, spray torch (DC power source) arranged according to specifications</p> <p>8.3. Suitable filler wires selected and the dual wire feeder mechanism adjusted to get the desired melt rate</p> <p>8.4. The compressed air jet flow speed adjusted as appropriate</p> <p>8.5. Thin layers deposited by correct manipulation of the torch</p> <p>8.6. The sprayed surface allowed to cool down slowly</p>

RANGE STATEMENT

Work connected to this unit may take place in a welding workshop / training centre or in a worksite. It will include building up and hard facing material in flat and horizontal positions. The physical characteristics of metal deposits made by this process are such that all types of inspection requirements can be met if the procedures can be fulfilled as specified.

Tools, equipment and material used in this unit may include

- Hand tools (used for cleaning purposes)
- Gas welding equipment complete with accessories, gas cylinder
- MIG/MAG welding machine
- Metal spraying unit to be connected to gas welding equipment.
- Metal spraying unit to be connected to Arc welding equipment.
- Plasma powder spraying machine complete with accessories.
- TIG welding machine.
- Arc welding machine
- Safety gear and equipment
- Electric arc welding tool kit
- Portable grinder with accessories
- Clamps and other clamping devices
- Carbon steel and alloy steels (Filler rods, electrodes, filler wire coil, filler power as applicable)
- Metal thickness from 6mm upwards
- Suitable flux granules

Work shall be performed according to drawings, sketches / templates, specifications and instructions as appropriate, and to predetermined standards of quality and safety, and adhering to relevant environmental regulations.

Hard/Sprayed surfaces shall be finished as required by the job specification.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safe practices in all operations
 - Hard facing – cleanliness of surface to be hard faced. (Free of rust, scales and all other foreign matter)
 - Prevent dilution of the deposit by the waste metal.
 - Flat position only (most hard facing electrodes are designed to be run in the flat position only)
 - No slag inclusions.
 - Metallizing
 - Cleanliness of surface to be hardened.
 - Roughness of the surface (for mechanical anchorages for sprayed metal particles)
 - Less porosity of sprayed surface.
 - Less oxidation of metal melted.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Relevant workplace procedures.
- Relevant product manufacturing specifications.
- Relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The welded joints may be tested by;

- Destructive tests, to test the
 - Hardness
- Non destructive tests such as the following, to locate cracks or flaws
 - Hardness test
 - Liquid penetrant
 - Visual test
 - Magnetic particles

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE ANDSKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none"> • Properties of materials & heat implications in welding 	<ul style="list-style-type: none"> • Application and control of different welding equipment used in hard

<ul style="list-style-type: none"> • Electric arc welding, Gas welding, MIG/MAG welding, TIG welding, Plasma processes and metal spraying processes • Hazards in using gases and electricity for welding & its safety • Hard facing electrodes, filler rods, filler coils, metal powder and fluxes used in hard facing and metal spraying • Hardness testing • Hard facing metal spraying techniques • Destructive and non-destructive testing of welds • Safety precautions and procedures and the use of safety gear 	<p>facing/ metal spraying</p> <ul style="list-style-type: none"> • Manipulation of welding electrode, welding Torch, metal spray torch/gun as applicable to deferent hard facing/ metal spraying processes • Cleaning of work pieces before hard facing or metal spraying. • Follow safety procedures and handle safety gear
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UNIT TITLE	Weld metal by submerged arc welding process				
DESCRIPTOR	This unit covers the competencies required for selecting of welding equipment and perform welding by submerged arc welding process, ensuring safe work practices in the use of material and equipment.				
CODE	CON02S2U24V1	Level	3	Credit	3

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cut material to size	1.1. Material required for the job selected according to specifications 1.2. Drawings interpreted and measurements, marked accurately on materials selected, as per drawing / templates 1.3. Material cut according to measurements in the drawing
2. Prepare welding edges	2.1. Weld edges prepared by flame cutting / grinding according to specifications 2.2. The prepared metal surfaces cleaned for welding
3. Set arc welding equipment with the self propelled carriage, filler wire and flux	3.1. Suitable welding filler wire and flux selected for the job 3.2. AC or DC welding set selected and assembled for safe operation 3.3. The self-propelled carriage of the automatic submerged arc welding equipment set and arranged 3.4. Suitable welding current selected according to thickness of material, type of joint, flat or horizontal positions and welding electrode size
4. Tack weld the metal pieces	4.1. Parts secured for welding using clamps, tags. Pieces welded for starting & ending 4.2. The tag pieces tack welded and work aligned
5. Weld metal with submerged arc in flat or horizontal positions	5.1. An arc struck and adjustments made to wire feed rate to suit the flux flow rate 5.2. Metal welded by setting the gun keeping the required travel speed and angle, taking care for distortions and deformations

	<p>5.3. Weld chipped and ground as necessary</p> <p>5.4. Starting and ending tags removed</p> <p>5.5. 5.5 Work piece cleaned and visual weld test performed according to the requirement</p> <p>5.6. Any repair to the welded joint made as necessary, to ensure correct weld & penetration according to required quality</p>
6. Build up metal by submerged arc welding process	<p>6.1. Filler metal, equipment, polarity and flux selected and adjustments made to suit the required filling & position</p> <p>6.2. Metal surface cleaned and the metal built up by setting the gun, maintaining travel speed and angle</p> <p>6.3. Filled surface ground and evened out, if necessary,</p> <p>6.4. Adequate runs of weld performed, as necessary</p> <p>6.5. The filling checked for continuity, evenness, quality and completeness</p>
7. Perform hard facing operations	<p>7.1. Filler metal, equipment, polarity and flux, selected and adjustments made to suit the required filling & position</p> <p>7.2. Metal surface cleaned and hard facing operation performed, by maintaining travel speed, angle and avoiding distortion</p> <p>7.3. Filled surface ground and evened out if necessary</p> <p>7.4. Adequate runs of weld performed as necessary</p> <p>7.5. The filling checked for continuity, evenness, quality and completeness</p> <p>7.6. The metal surface cleaned</p>

RANGE STATEMENT

Work connected to this unit may take place in a welding workshop or in a worksite. It will include welding, building up and hard facing of steel in flat and horizontal positions. The physical characteristics of welds made by this process are such that all types of inspection requirements can be met, if the procedures can be fulfilled as specified.

Tools, equipment and material used may include;

- Measuring and marking out tools
- Hand tools
- Hand shears & bench shears
- Guillotine machine
- Hand hack saw & power saw
- Gas cutting equipment including the profile cutter
- Submerged arc welding machine complete with accessories
- Safety gear and equipment
- Portable grinder with accessories
- Set of welding gauges
- Clamps and other clamping devices
- Mild steel, Carbon steel and alloy steels
- Metal thickness from 6mm upwards
- Copper coated electrode coils
- Suitable flux granules / powder to suit the material to be welded

Work shall be performed according to drawings, sketches / templates, specifications and instructions as appropriate, and to predetermined standards of quality, safety and adhering to relevant environmental regulations.

Welded joints shall be finished as required by the job specification.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)
- The Lloyds Standards

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment and/or holistic assessment are suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on the job, demonstrated by an individual working alone, or as a member of a team

Critical aspects

- Safe practice in all operations.
- Prevent impurities collect towards the centre of the weld.
- The process either fully automatic or semi automatic, the setting should be correctly made to get a quality weld.

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Relevant workplace procedures.
- Relevant product manufacturing specifications.
- Relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

The welded joints may be tested by;

- Destructive tests, to test the
 - Bending stress
 - Hardness

- Tensile strength
- Impact nick breaking point
- Non destructive tests such as the following, to locate cracks or flaws
 - Visual test
 - Magnetic particles
 - Radiographics
 - Liquid penetrant
 - Ultrasonics

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE ANDSKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none"> • Properties of materials & heat implications in welding • Submerged arc welding process • Hazards in using electricity for welding & its safety • Electrode coil sizes to suit different type of welds, positions and purpose 	<ul style="list-style-type: none"> • Read and interpret engineering drawings • Application of submerged arc welding equipment for welding and building up purposes • Adjustment of electric current to suit different plate thicknesses, types of

<ul style="list-style-type: none"> • Use & control of welding current according to different types of welds, positions and purpose • Types of welding electrode coils, fluxes and their specifications • Principles of operation of welding rectifier, transformer and generator / converter for submerged arc welding • Welding positions • Types of joints and grooves • Building up and hard facing of metal with submerged arc welding • Welding with AC and DC and use of correct polarity • Welding symbols & specifications according to accepted standards • Destructive and non destructive testing of welds • Weld defects and correction • Safety precautions and procedures and the use of safety gear 	<p>electrode coils, welds, positions and purpose</p> <ul style="list-style-type: none"> • Adjustment of welding wire feed rate, speed, arc length and angle according to weld positions • Grinding of welds using angle grinder • Clean & finish the weld as required • Visual testing of welds • Correction of welds • Ability to read and interpret an engineering drawing • Follow safety procedures and handle safety gear
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UNIT TITLE	Cut metal by plasma cutting process				
DESCRIPTOR	This unit covers the competencies required for setting the welding equipment and to cut metal in all positions, while ensuring safe work practices.				
CODE	CON02S2U25V1	Level	3	Credit	3

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Arrange plasma cutting equipment for cutting ferrous and non ferrous metal	1.1. Regulators connected to gas cylinder or compressed air pressure outlet ports 1.2. Gas hoses attached to regulator, the cutting machine, the cutter, checked for leaks 1.3. The tungsten electrode checked and positioned, and the gas cap/ plasma cutting head installed, for cutting operation 1.4. The ground lead of the cutting machine attached to bench or the work piece depending on the process 1.5. The electrode holder lead attached to cutting machine correctly 1.6. Exhaust systems checked and arranged in place, to remove fumes when cutting metal 1.7. Cutting machine switched on and the system checked before cutting for safe operation
2. Cut ferrous and non ferrous metal by plasma process, manually	2.1. Drawings, templates interpreted and measurements accurately marked on the metal selected 2.2. Ferrous and non ferrous metal required for the job selected and secured for cutting 2.3. The plasma cutting machine turned on and amperage adjusted to suit the metal to be cut 2.4. Gas purged to torch/cutter and pilot arc initiated for cutting 2.5. Plasma arc established at the edge of the work piece 2.6. The metal cut by manipulating the cutting torch with correct gap, travel speed and

	<p>angle</p> <p>2.7. The cut metal checked and any corrections made if necessary</p> <p>2.8. Burrs removed edges ground and evened out if necessary</p> <p>2.9. The cut metal surface cleaned as required</p> <p>2.10. The workplace and the cutting equipment cleaned and made ready for next operation</p>
<p>3. Cut ferrous and non ferrous metal by plasma process on travelling tractor</p>	<p>3.1. The plasma cutting machine turned on and amperage adjusted to suit the metal to be cut</p> <p>3.2. The cutting equipment set on travelling tractor and necessary adjustments made to suit the cutting required</p> <p>3.3. Gas purged to torch and pilot arc initiated for cutting</p> <p>3.4. Plasma arc established at the edge of the work piece</p> <p>3.5. The metal cut with correct gap, travel speed and angle</p> <p>3.6. Plasma cutting operation monitored and carriage reset for next cut</p> <p>3.7. Burrs removed, edges filed and evened out if necessary</p> <p>3.8. The cut metal surface cleaned as necessary</p> <p>3.9. The work and the cutting equipment with travelling tractor cleaned up and made ready for next operation</p>

RANGE STATEMENT

Work connected to this unit may take place in a welding workshop/ training center/ worksite. It will include plasma cutting of ferrous and non-ferrous metals.

Tools, equipment and material used in this unit may include

- Measuring and making out tools
- Hand tools
- Plasma cutting equipment (complete with cutting torch and gas) for manual cutting

- Mounted Plasma cutting equipment (complete with cutting torch, traveling tractor and gas) for automated cutting
- Suitable exhaust systems for extraction of fumes
- Portable grinder
- Safety gear and equipment
- Ferrous and non ferrous metal plates/ bars/ angles/ pipes
- Wire brush
- Nozzle cleaner
- Chipping hammer

Work shall be performed according to drawings, sketches / templates, specifications and instructions as appropriate, and to predetermined standards of quality and safety, and adhering to relevant environmental regulations.

The metal cutting included in this unit has to be performed to the levels expected by one of the following:

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)
- The Lloyds Standards

ASSESSMENT GUIDE

Forms of assessment

Continuous assessment and/or holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, or a combination of on and off the job, demonstrated by an individual working alone, or as a member of a team.

Critical aspects

- Safe practice in all operations, including compulsory wearing of face mask recommended by manufacturer

- When cutting aluminium and stainless steel best results are obtained with argon-hydrogen or nitrogen-hydrogen gas mixture.
- Typical plasma cutting conditions. (Power supply, gas flow to appropriate settings according to material and the thickness)

Assessment condition

The candidate will have access to:

- All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- Relevant workplace procedures.
- Relevant product manufacturing specifications.
- Relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

Special notes

During assessment, the candidate will:

- Demonstrate safe-work practices at all times.
- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her own work.
- Plan tasks in all situations and review task requirements as appropriate.
- Perform all tasks in accordance with standard operating procedures.
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and workplace procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

Material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none">• Types of measuring and marking tools and their uses• Safety principles• Properties of metals• Reading & interpretation of drawings• Plasma cutting process• Hazards in using gas for cutting and safe practices• Control of gas input with regulators• Types of plasma gasses and its applications• Typical plasma cutting conditions• Safety precautions and procedures and the use of safety	<ul style="list-style-type: none">• Marking out procedures• Care & maintenance of tools & equipment• Plasma cutting equipment handling and cutting practices• Use of hand tools• Interpretation of drawings• Use of plasma machine for metal cutting purposes with and without travelling tractor• Read and interpret engineering drawing• Clean the workplace and the tools and equipment• Follow safety procedures and handle safety gear

UNIT TITLE	Plan and prepare estimates for welding				
DESCRIPTOR	This unit covers the competencies required to plan and prepare estimates for Oxy-acetylene welding, manual arc welding, spot welding, soldering and brazing and cutting metal by Oxy-acetylene / Oxy-fuel flame.				
CODE	CON02S2U26V1	Level	3	Credit	10

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Determine customer requirements	<p>1.1. Data required for welding job, collected from the models, sketches or drawings supplied, or by visiting the clients sites</p> <p>1.2. Purpose & type of the welding and material required, determined by interpreting sketches/drawings/ models supplied by customer/client</p> <p>1.3. Conceptual drawings, work plan, for the job prepared, briefed to client & approval for the production obtained</p>
2. Prepare estimates for the fabrication	<p>2.1. Sketches /drawings prepared with available data</p> <p>2.2. Accessories, and other fixtures / components listed as required for the welding of the job listed</p> <p>2.3. Machinery & tools required for the welding job listed</p> <p>2.4. Material quantified and cost estimated including added percentage for wastage</p> <p>2.5. Welding time estimated considering worksite conditions and welding hours & charges for welding of individual components of the job calculated</p> <p>2.6. Complete estimate for the welding prepared, by adding full cost of production, cost for transport & logistics, inclusive of overheads and profit, according to company policy</p>

<p>3. Prepare work plan & obtain clients approval to commence work</p>	<p>3.1. Work plans/flowcharts for the welding each item of the prepared & due dates for completion estimated</p> <p>3.2. Cost of entire welding job & the due date of delivery/handling over informed to the client</p> <p>3.3. Approval to commence the welding job obtained from the client, by submitting drawings, cost estimate & other relevant information and by negotiating & agreeing to deliver on targets</p>
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RANGE STATEMENT

Work connected to this unit shall take place at a company office or construction work sites.

The Welding connected to this unit shall include:

- Perform spot welding
- Cut steel by Oxy-acetylene / Oxyfuel flame
- Weld steel plates by manual arc welding In 1F,2F,3F,1G,2G, positions and build up
- Weld steel plates by manual arc welding In 3G,4G, and 4F positions
- Weld steel pipes by manual arc welding in all positions
- Weld stainless steel plates by manual arc welding in all positions
- Weld stainless steel pipes by manual arc welding in all positions
- Perform soldering and brazing
- Weld steel / aluminium plates by Oxy Acetylene welding In 1F,2F,1G and 2G positions
- Weld steel/aluminium plates by Oxy Acetylene welding In 3F,4F,3G and 4G positions
- Weld steel/aluminium pipes by Oxy Acetylene welding In all positions

Tools, equipment and material used in this unit may include

- Measuring and marking out tools
- Drawing instruments
- Drawing paper
- Flow chart paper
- Ancillary handling tools
- Models
- Specimen forms
- Safety gear

The work connected with welding is performed according to drawings/ sketches/ specifications and instructions as appropriate & to predetermined standards of quality and safety, and adhering to the relevant environmental regulations and procedures.

Welding included in this unit has to be performed to the level specified by one of the following

- The International Standards Organisation (ISO)
- The British Standards Institution (BSI)
- The American Welding Society (AWS)
- The German Institute for Standardisation (DIN) - Deutsches Institut für Normung
- The American Society of Mechanical Engineers (ASME)
- The American Society for Testing Material (ASTM)
- The Lloyds Standards

ASSESSMENT GUIDE

Forms of assessment

Continuous/holistic assessment is suitable to assess the competencies of a welder with regard to this unit.

Assessment context

This unit may be assessed on or off the job, demonstrated by an individual working alone or as a member of a team.

Critical aspects

The assessment must confirm that the candidate is able to :

- Gather information from client
- Interpret drawings/sketches
- Calculate costs
- Calculate welding times

Assessment condition

The candidate will have access to

- All tools, equipment, material, blue prints, sketches, workshop drawings and other documentation required.

The candidate will be permitted to refer to the following documents:

- Relevant work place procedures
- Relevant products manufacturer's information
- Relevant drawings, manuals, codes, standards & reference material

The candidate will be required to:

- Orally, or by other methods of communication, answer questions asked by the assessor.
- Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, and that he/she possess the required underpinning knowledge.

Special notes

During the assessment, the candidate will;

- Communicate information about processes, events or tasks being undertaken to ensure a safe and efficient working environment.
- Take responsibility for the quality of his/her work
- Plan tasks in all situations and review task requirements as appropriate
- Perform all tasks to specification.
- Use accepted engineering techniques, practices, processes and work place procedures.

Tasks involved will be completed within reasonable time frames relating to typical workplace activities.

Resources required for assessment include;

These include material, tools, equipment and machines listed within this unit.

UNDERPINNING KNOWLEDGE AND SKILLS

Underpinning Knowledge	Underpinning Skills
<ul style="list-style-type: none"> • Properties of steel • Specification on commonly used steel sections • Types of semi finished metal 	<ul style="list-style-type: none"> • interpret blueprints / sketches/engineering drawing to determine scope of metal fabrication and the skills in

<p>products like L,U channels & their current market price</p> <ul style="list-style-type: none"> • Producers to be followed when making estimates, standard components of estimates, standard methods of calculating labours overhead-cost etc • Methods of communication as practiced at workshop / construction sites / fabrication yard • Reading and interpretation of plans and related knowledge of symbols in metal fabrication / welding drawings • Safely precautions when working on platforms scaffolding and at heights • Customer handling techniques • Tools, equipment, machinery and material used for welding • Measuring tools and taking measurements • Methods of preparing work plans • Knowledge of safety gear 	<p>developing an idea from details available with clients or model</p> <ul style="list-style-type: none"> • Measuring of intricate shapes • Drawing sketches and assembly drawings of the components • Measurements & marketing out • Safe working at heights and adherence to safety precaution & avoid unsafe acts and unsafe acts and unsafe conditions • Prepare flow charts • Prepare work plans • Develop sketches and work plans for individual unit components from the master drawing /specimens / models
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