



Module Descriptor

Manual Arc Welding

Award Type: Minor
Award Level: 3
Award Code: 3N0917
FÁS Assessment Code: 3N0917-026
Validation date 22nd August 2011

Revision 2.0

Module Descriptor

Purpose: The purpose of this module is to equip the learner with the knowledge, skill and competence to use arc welding equipment to produce a range of welded joints in mild/low carbon steel under supervision

Module Duration: 100 hours

Learning Outcomes: By the end of this module, the learner will be able to:

1. Describe the process and application of manual arc welding
2. Describe the operation of an arc welding plant to include the parts and functions of arc welding equipment
3. Select the tools, materials and equipment to produce various arc welded joints
4. Set up welding equipment
5. Deposit weld beads in a straight line by weaving in a down hand position after striking, maintaining, breaking and restarting arc
6. Weld butt joints, tee joints, lap joints and corner joints in down hand position using mild steel plate
7. Maintain a safe working environment by applying appropriate health, safety and personal hygiene procedures
8. Apply communication, teamwork and quality awareness skills in the workshop

Key Learning Points

Learning Outcome 1: Describe the process and applications of manual arc welding

Key Learning Points

- Process – filler metal melted from end of electrode based on production of electric arc, in a basic arc welding circuit heat created by current flow
- Setting voltage and current
- Explaining how electric arc is produced and maintained during process
- Use of electrode to melt filler metal
- Basic arc welding circuit
- Common applications - welding in general fabrication, shipbuilding, railways, pipelines, refurbishment work, boilers and vessels etc.
- Welding fabrications as an alternative to castings
- Prevention of build up of worn parts
- Types of joints e.g. butt, tee, lap, corner and edge
- Welding positions

Learning Outcome 2: Describe the operation of an arc welding plant to include the parts and functions of arc welding equipment

Key Learning Points

- Electrical terms used in welding process - DC – direct current, AC - alternating current, Electrical resistance
- Relationship between voltage, current and resistance
- Transformer operating principles - Adjustment of transformer output
- Difference in operation between AC and DC welding plants
- Current ranges generated in AC welding plant
- Advantages and disadvantages of AC and DC welding plants
- Oil cooled and air cooled welding plants

Learning Outcome 3: Select the tools, materials and equipment for use in various arc welding joints

Key Learning Points

- Welding leads
- Welding return cable and clamps
- Electrode selection and classification – Coating characteristics and functions in the welding process

- Electrode holders
- Earths
- Isolator switches
- Head/hand shields
- Chipping hammer
- Wire brushes
- Personal protective equipment
- Types of metals - Ferrous/non ferrous common form of supply black mild steel e.g. angle, flat or RSJ
- Distinguishing between black and bright mild steel
- Welding tools
- Safety considerations

Learning Outcome 4: Set up welding equipment

Key Learning Points

- Identifying controls
- Connecting leads
- Arc voltage
- Method of striking arc
- Breaking arc
- Restriking arc
- Types of power source - AC and DC welding plants
- Current settings – electrode angle – speed of travel
- Distortion Control: tacking, heat input, back stepping

Learning Outcome 5: Deposit weld beads in a straight line by weaving in a down hand position after striking, maintain, breaking and restarting arc

Key Learning Points

- Setting arc voltage
- Setting amperage
- Striking arc
- Electrode movement - speed of travel and angle
- Maintaining arc length
- Applying weaving technique in a down hand position
- Restarting after electrode change

Learning Outcome 6: Weld butt joints, tee joints, lap joints and corner joints in down hand position using mild steel plate

Key Learning Points

- Reading drawings to include orthographic single component drawings
- Welding terminology; weld profile, leg length, throat thickness, root etc.
- Interpretation of weld symbols: T joint, Lap joint, Butt joint, corner joint symbols
- Joint representation using symbols
- Preparation of metals
- Preparation of equipment
- Checking voltage and amperage
- Safety considerations
- Melting parent and filler metals
- Joint fusion and solidification
- Identification of weld defects; slag inclusion, undercutting, incomplete penetration, excessive penetration, porosity and lack of fusion
- Welding butt joints, tee joints, lap and corner joints
- Linear and angular measurement
- Use of steel rule, tri square and measuring tape
- Use of combination set including protractor
- Checking squareness and angular measurement
- Metric measurements

Learning Outcome 7: Maintain a safe working environment by applying appropriate health, safety and personal hygiene procedures

Key Learning Points

- workshop health and safety regulations
- Identifying hazards
- Hazards – arc eye, skin exposure, fume inhalation and electric shock.
- Personal Protection equipment
- Procedures for fire safety
- Procedures for accident reporting
- Applying health and safety procedures in carrying out tasks in the workshop
- Safe use and storage of all tools and equipment
- Safe storage of electrodes
- Protection of exposed skin
- Application of appropriate hygiene practices

Learning Outcome 8: Apply communication, teamwork and quality awareness skills in the workshop

Key Learning Points

- Knowledge of vocational language
- Listening and responding to spoken language
- Reading and writing to obtain and convey information
- Applying appropriate health and safety procedures
- Reflecting on own strengths and weaknesses
- Identifying areas for improvement
- Ability to work independently if required
- Participating in a team

Assessment Specification

Award Title	Manual Arc Welding
Award Type	Minor
Framework Level:	3
Award Code:	3N0917
Credit Value :	10

Assessment No.	Duration	Assessment Details	Weighting	Stage at which assessment takes place
SD1	N/A	3 Skills Demonstrations consisting of fillet welding a Tee piece, a Lapped piece and a Corner piece.	90%	End of Module
PO1	N/A	Teamwork exercise which consists of working in a team to source information on welding. Assemble information in a folder. Review how team worked.	10%	During module

Key: SD= skills demonstration, P= Portfolio

Suggested Learning Methodologies

- Skills Demonstration
- Practical Work Training
- Simulated Work Environment
- Note taking
- Discussion groups
- Activities and exercises
- Role play

Specific Module Requirements

The following is a recommended list. The list is not definitive as some of the items listed may not be essential in order to run the course. Items other than those listed may also be acquired for the course at the discretion of the Manager

Designated individual work areas with Arc Plant
Gas Welding Lints
Welding Masks
Gloves
Aprons
Fire retardant overalls
Safety boots
Arc Welding Shields

Suggested Learning Resources

All of the highlighted Curriculum Resources mentioned below are available on the Moodle Community Services Curriculum and Assessment page
You can access the CSCA Moodle web page from this link:

<http://www.ecollege.ie/site/home.html>

Generic Skills: Literacy and Numeracy

The learners will keep and maintain a **Learning Diary** throughout the course in order to record and file any useful and relevant information on any aspect of Manual Arc Welding.

Identify the tools, materials and equipment used in Manual Arc Welding. Find information from books and magazines. Record this information in your Learning Diary.

At the end of every week the learners will complete a short **Weekly Reflective Sheet** in order to reflect on their learning and progress during that week.

This Weekly Reflective Sheet will assist the learners to develop their generic skills of literacy, numeracy, communications and quality awareness and will give learners an opportunity to develop their writing skills.

The learners will create a **Personal Dictionary** of new words, key words and terms relating to Manual Arc Welding. This Dictionary will be updated each week and kept in the Learning Diary.

The learners, as a group, will add words and terms to a **Key Word and Terminology Bank** in the classroom, relating to Manual Arc Welding. The learners will find words listed in text books, class notes, DVDs and internet websites etc.

Generic Skill: Numeracy; Digital

Learners will practice **using a calculator**, identifying and locating all keys needed to carry out basic calculations.

The learners will practice solving various problems, involving metric measurement etc, set by the instructor, refer to the **mathematical glossary** for measurement terms.

Generic Skill: Teamwork and Communications

Learners will discuss the importance of teamwork with the instructor using the **Teamwork Guide**.

Learners will take part in a teamwork exercise by designing, planning and carrying out a project which will incorporate group discussions.

Recommended by: _____

Manager Training Policy Development and Support

Approved by: _____

Director Training Policy Development and Support