Training Guide
Electric Arc Welding (non code).

Training Guide Objectives: After completing the training the student will be able to;

- Set up and inspect the Electric are welding power source for electric arc welding.
- Prepare the job site.
- Prepare the material for electric arc welding.
- Indentify code and non-code welding.
- Indentify the proper safety equipment.
- Prepare to weld the material.
- Perform the skills used for electric arc welding processes for (non-code) welding (Lab).

Approximate Time: 80 Hours.
Lab: 80 Hours.
Written Test: 1 Hour
Review Test: 1 Hour

Student Reference: Maint Procedure MNT-WELD-006. Electric arc welding power source, and material to be welded for (non-code) welding.

Training Guide Outline.

1. Set up and inspect the welding power source.
   Electrical power to the welding source.
   Liquid coolant levels
   Welding power source ground cable connections.
   Welding power source welding cable connections.
   Adjustment of the Electric arc welding power source.
2. Prepare the job site.
   Clearing the job site of all flammable materials.
3. Prepare the material for welding.

Clean the material.
Check material fit up.

4. Code and non-code welding.
   Code welding.
   Non-code welding.
5. Identify the proper safety equipment.
   Proper personal safety equipment.
6. Prepare to weld .
   Select the proper welding rods.
   Select the proper hands tools.
   Placement and connection of ground cable and welding cable.
7. Perform the skills used for Electric arc welding (non-code). (Lab).

Electric Arc Welding (non-code) LAB

One of the most important things to be done when using Electric arc welding equipment is the inspection of the equipment before use. Inspection of the equipment is important because the failure to do so could result in serious personal injury and/or property damage.

1. Set up and inspect the welding power source.

Before you can operate the Electric arc welding power source you must make sure that it has power. Check to make sure that the welding power source is plugged in properly, and that it is operating.

After checking the power you must check the coolant level (if applicable) to make sure it is sufficient.

Not all electric arc welding power sources use coolant. In the weld dept we have (2) two makes and three models of electric arc welding power sources that use coolant. The Miller Syncrowave 300, the Lincoln Idealarc 300 / 300 AC/DC, and the Lincoln Square Wave TIG-355.

The Miller Syncrowave 300 uses an **anti freeze** coolant that may be obtained at the garage. The cooling trough for this machine is located on the bottom front side of the machine.

The Lincoln Idealarc 300/ 300 AC/DC also use an **anti freeze** coolant that may be obtained at the garage. The cooling trough for this machine is located on top of the machine.

The Lincoln Square Wave TIG-355 uses only **water**. The cooling trough for this machine is located on top of the machine.

CAUTION: Operating this equipment with a low coolant level may cause damage to the equipment.

All other electric arc welding power sources used at the refinery are air cooled and use no coolant.

Check the electric arc welding power source ground cable and welding cable for damage. If the connectors are damaged and/or bare wire is showing, **DO NOT** use the cables.

WARNING: Using ground cables or welding cables that have bare wire showing may cause sparking that can cause a fire, resulting in serious personal injury and/or property damage.

After you have inspected the electric arc welding power source and found everything to be satisfactory you must set the power source to the arc welding mode (depending on the power source being used).

All of the above mentioned power sources (with the exception of the air cooled machines) have (2) two modes, arc welding, and “TIG” welding.

The power source must be set in the mode for the type of welding you are going to perform or it will not operate. You will learn how to set these power sources in the lab exercise at the end of this Training guide.

2. Prepare the job site.

Prepare the job site by cleaning up any flammable materials such as paper, wood, rags, or any hydrocarbons that may have been spilled on the floor in the area where the electric arc welding will take place.

WARNING: Failure to clear the work area of all flammable materials may result in a fire causing serious personal injury and/or property damage.

3. Prepare the material for welding.

Material that is to be welded must be as clean as possible. You must clean the material by removing all rust, mill scale, oil, or any other foreign substance that may interfere with the electric arc welding process.

Remove all sharp edges from the material to avoid injury to the hands. This may be done by using a grinder or a file.

WARNING: Failure to clean the material of all sharp edges may result in injury to the hand.

Check the fit up of the material before welding to make sure it is correct.

4. Code and non-code welding.

Code welding is any type welding that requires X-ray or NDT (non destructive testing). High pressure pipe, low pressure pipe, and vessels, must meet A.S.M.E and BP spec codes. To weld high pressure pipe, low pressure pipe and vessels the welder must have S.M.A.W. certifications. High pressure pipe, low pressure pipe, and vessels, may be made of exotic metal (chrome, stainless steel, inconel, etc.) or Carbon steel. The welder must have an S.M.A.W. certification for each different type of metal and the completed weld must be stamped with the welders designated stamp.

To weld structures such as building structures the welder must have an L.A. City certification.

Non-code welding is any type of welding that does not require X-ray or NDT (non destructive testing.) Pipe brackets that are not welded directly to the pipe, some floor plate, machinery guards, and unistrut are some examples of non-code welding. No welder certifications are required for non-code welding.

5. Identify the proper safety equipment.

The proper safety equipment used for electric arc welding consists of welding gloves, ear protection, long sleeves, and the proper eye protection.

These safety items must be worn at all times while carrying out the electric arc welding process.

The proper eye protection for electric arc welding is a welding helmet (hood). The recommended lens shade for electric arc welding is a #10 or #11 shade lens.

WARNING: Failure to wear the proper safety equipment while carrying out the electric arc welding process may result in serious personal injury.

6. Prepare to weld.

The type welding rods to be used for the electric arc welding process depends on the type of material being welded.

If the material to be welded is carbon steel the rod that will be used is E-6010, (E-6011 for sheet metal), or E-7018. In the weld dept we use rods that range in sizes from 3/32” inch up to 3/16” inches in diameter. The size of welding rod to be used depends on the size of the job.

If the material to be welded is exotic metal (chrome, stainless steel, inconel etc.) you must determine the type and grade before selecting the type welding rod to be used. For code welds the engineering weld procedure will list the type and grade of the material and the type of welding rod to be used. If you have no Engineering procedure and you are not sure what the material is, you may call on the Inspection dept. to analyze the material.

The hand tools used for electric arc welding are common welding hand tools.

The basic welding hand tools used when electric arc welding consist of a Slag hammer, wire brush, file, scraper blade, ball peen hammer, tape measure, level, grinder, and flange pins.

Any special tools that you need for the electric arc welding process may be checked out at the tool room in the Maint shops building.

When connecting the electric arc welding power source ground cable and welding cable you must make sure that the cables are tightly connected together.

The ground cable clamp must be attached as close to the weld area as possible.

CAUTION: When welding on machinery that has moving parts, place the ground cable clamp as close to the weld area as possible to keep the current from circulating through the machine. Failure to do so could cause damage to the equipment bearings, and possible equipment failure.

7. **Perform the skills used for electric arc welding (non-code). (lab).**

Electric arc welding (non-code)
Qualification Signoff Sheet

Name: _____
Date:_____
Instructor: _____

Needed Equipment: Maint Procedure MNT-WELD-006, Electric arc welding equipment, tools, and material.

Lab Exercise:

Step 1: Set up and inspect the electric arc welding power source.
Step 2: Prepare the job site.
Step 3: Prepare the material for welding.
Step 4: Identify code and non-code welding.
Step 5: Identify the proper safety equipment.
Step 6: Prepare to weld material.
Step 7: Perform the skill used for electric arc welding (non-code).
Step 8: Contact instructor for verification of lab completion.

Criteria:

This lab exercise will be graded on how well instructions are carried out, the safe workmanship of the student, and the knowledge obtained from the Training Guide. This equipment must be set up and operated as per BP Maint Procedure MNT-WELD-006.

LAB

Pass Fail Signature: _____
Signature: _____

Written Test (80% passing) Score: _____