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	Company Doc. No. HSEDOCS-SMAW-00-000	Contractor Ref. No. QHSE-SMAW-0000	Date 00-00-0000	Revision 00

PROCEDURE FOR SHIELDED METAL ARC WELDING (SMAW)

Project No:	
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REVISION HISTORY	ISSUE DATE	DESCRIPTION	REVIEW / STATUS
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PREPARED BY:	REVIEWED & APPROVED BY:
QA QC ENGINEER	PROJECT ENGINEER

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1.0. Scope and Objective

Shielded Metal Arc Welding, commonly known as stick welding, is a widely used welding process that involves creating an arc between a coated electrode (and "stick") and the base metal to form a weld joint. Here's a step-by-step procedure for performing Shielded Metal Arc Welding:

2.0. Preparation

- 2.1. Ensure you have the appropriate PPE: a welding helmet with the correct shade, safety glasses, welding gloves, flame-resistant clothing, and steel-toed boots.
- 2.2. Set up your welding machine according to the electrode and material specifications, including selecting the correct current and voltage settings.

3.0. References

List the relevant international standards, codes, and specifications applicable to pipeline welding. For example:

- 3.1. API 1104: Welding of Pipelines and Related Facilities
- 3.2. ASME B31.4: Pipeline Transportation Systems for Liquids and Slurries
- 3.3. AWS D1.1: Structural Welding Code - Steel

4.0. Electrode Selection

- 4.1. Choose the appropriate electrode for the material being welded and the welding position.
- 4.2. Refer to electrode classification codes to identify the type, intended use, and suitable welding conditions.

5.0. Joint Preparation

- 5.1. Clean the joint surfaces by removing dirt, rust, grease, and other contaminants.
- 5.2. Ensure proper joint fit-up, including gap and bevel angles if required.

6.0. Electrode Handling and Storage

- 6.1. Keep the electrodes in a dry and clean electrode oven if required.

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- 6.2. Only take out the electrodes you intend to use in the immediate future to prevent moisture absorption.

7.0. Striking the Arc:

- 7.1. Hold the electrode holder at a comfortable angle and distance from the workpiece.
7.2. Touch the electrode to the workpiece and then quickly lift it to create an arc. Maintain a consistent arc length.

8.0. Welding Technique

- 8.1. Maintain the correct arc length throughout the welding process.
8.2. Move the electrode along the joint in a controlled manner, paying attention to the welding direction and angle.
8.3. Use appropriate weaving or oscillation techniques to ensure proper weld penetration and fusion.

9.0. Electrode Angle

- 9.1. Maintain the correct electrode angle to the joint.
9.2. The angle affects the bead shape and penetration.
9.3. Refer to welding procedure specifications for recommended electrode angles.

10.0. Welding Progression

- 10.1. Depending on the joint configuration and welding position, decide on the appropriate welding progression (e.g., uphill, downhill, horizontal, vertical).

11.0. Electrode Manipulation

- 11.1. Control the manipulation of the electrode to control the weld pool and bead shape.
11.2. Drag or push the electrode, depending on the welding technique and electrode type.

12.0. Slag Removal

- 12.1. Allow the weld bead to cool slightly before chipping off the slag using a slag hammer or wire brush.
12.2. Remove slag between passes to ensure proper fusion and penetration.

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13.0. Electrode Change and Restart

- 13.1. Change the electrode as needed, following the same procedure for striking the arc.
- 13.2. Restart by creating a new crater and then continuing the weld.

14.0. Welding Electrode Storage and Handling

- 14.1. Describe proper storage and handling procedures for welding electrodes to ensure their quality and performance.
- 14.2. Include information about temperature, humidity control, and electrode rebaking when required.

15.0. Common Hazards, Associated Risks, and Control Measures

Welding for pipelines is very critical and various types of hazards and risks are required to be handled carefully to ensure the safety of welding work involved workers and the integrity of the pipeline. Below are some general critical hazards, associated risks, and control measures:

15.1. Electric Shock

15.1.1. Hazard

The Shielded Metal Arc Welding involves the use of electricity, which is very critical and poses a risk of electric shock to the welder and other persons working involved in the activity.

15.1.2. Risk:

Electric shock while carrying out the Shielded Metal Arc Welding can lead to injuries, burns, or even fatal accidents.

15.1.3. Control Measures:

- Ensure proper grounding and insulation of welding equipment.
- Use equipment with ground fault circuit interrupters (GFCIs).
- Inspect cables and connections for damage before use.
- Wear appropriate personal protective equipment (PPE) like insulated gloves and footwear.
- Provide training to personnel on safe electrical practices.

15.2. Welding Fumes and Gases

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15.2.1. Hazard

The Shielded Metal Arc Welding (SMAW) generates fumes and gases that can be toxic if inhaled and could impact negatively on human health.

15.2.2. Risk:

Inhaling welding fumes can lead to respiratory issues, dizziness, and long-term health problems.

15.2.3. Control Measures:

- Perform welding in well-ventilated areas or use local exhaust ventilation systems.
- Use respiratory protection, such as air-purifying respirators, when necessary.
- Choose welding methods with lower fume generation, if possible.
- Educate workers about the risks of welding fumes and proper prevention measures.

15.3. Fire and Explosion

15.3.1. Hazard:

Welding involves high temperatures and sparks, which can ignite flammable materials or gases.

15.3.2. Risk:

Fire or explosions can cause injuries, property damage, and disruptions.

15.3.3. Control Measures:

- Clear the work area of flammable materials and substances.
- Have fire extinguishers and fire watches ready during welding activities.
- Use welding blankets to shield nearby combustible materials.
- Maintain proper housekeeping to minimize fire risks.

15.4. UV Radiation and Eye Damage

15.4.1. Hazard:

Welding generates intense ultraviolet (UV) radiation that can damage the eyes and skin.

15.4.2. Risk:

Exposure to UV radiation without proper protection can cause arc eye (welder's flash) and long-term eye damage.

15.4.3. Control Measures:

- Wear welding helmets with proper shade lenses to protect the eyes and face.
- Use appropriate clothing to cover exposed skin.
- Provide designated rest areas for workers to reduce prolonged exposure.

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15.5. Noise

15.5.1. Hazard:

Welding operations produce significant noise levels.

15.5.2. Risk:

Prolonged exposure to high noise levels can lead to hearing loss.

15.5.3. Control Measures:

- Provide hearing protection, such as earplugs or earmuffs, to workers.
- Use sound barriers or acoustic enclosures to reduce noise levels.
- Rotate workers to minimize prolonged exposure to loud environments.

15.6. Ergonomic Hazards

15.6.1. Hazard:

Awkward postures and repetitive motions during welding can lead to musculoskeletal injuries.

15.6.2. Risk:

Workers can experience strains, sprains, and discomfort.

15.6.3. Control Measures:

- Provide proper workstations and ergonomic tools to reduce strain.
- Educate workers on proper body mechanics and posture.
- Encourage regular breaks and stretching exercises.

15.7. Heat and Burns

15.7.1. Hazard:

Welding involves high temperatures that can cause burns to the skin and eyes.

15.7.2. Risk:

Improper handling of hot materials or equipment can result in burns.

15.7.3. Control Measures:

- Wear heat-resistant gloves, clothing, and protective eyewear.
- Use insulated tools to handle hot materials.
- Ensure proper cooling time before touching welded components.

15.8. Confined Spaces

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15.8.1. Hazard:

Some pipeline welding may occur in confined spaces, which poses risks of asphyxiation, entrapment, or a hazardous atmosphere.

15.8.2. Risk:

Inadequate preparation for working in confined spaces can lead to life-threatening situations.

15.8.3. Control Measures:

- Follow confined space entry procedures, including gas testing and ventilation.
- Have a proper rescue plan in place.
- Train workers on confined space safety protocols.

15.9. Chemical Hazards

15.10. Hazard:

Certain welding materials, coatings, or substances used in pipeline construction can be hazardous.

15.11. Risk:

Exposure to these chemicals can lead to skin irritation, respiratory issues, or other health problems.

15.12. Control Measures:

- Store and handle materials properly.
- Use appropriate PPE for chemical handling and exposure.

Frequent technical and safety training and careful and responsive supervision are key to ensuring that all technical personnel are well aware of the hazards and the appropriate safety control measures to follow.

16.0. Inspection and Quality Control

16.1. Visually inspect the weld for defects such as cracks, lack of fusion, and porosity.

16.2. Use non-destructive testing methods if required, such as radiographic or ultrasonic testing.

17.0. Post-Weld Cleaning

17.1. Clean the weld area of any residual slag, spatter, and debris.

17.2. Ensure the completed weld meets the required quality standards.

Key Points:

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- Successful Shielded Metal Arc Welding requires practice and experience.
- Be sure to follow proper safety protocols, maintain your equipment, and adhere to industry standards and guidelines.
- It's also advisable to consult with certified welding professionals and refer to welding procedure specifications specific to your project.
- This methodology document should take into consideration the particular type of welding, the pipeline environment, and the relevant safety codes, standards, regulations, and technical guidelines in your country, state, or region.
- It's essential to conduct a complete hazard identification and risk assessment before proceeding with any welding project and practice and implement the mandatory required safety control measures to mitigate these hazards accordingly to avoid any legal notices.