AIR ARCING (GOUGING METAL)

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The following is a step-by-step procedure on how to complete a specific task or meet a facility specific requirement. Standard Operating Procedures (SOPs) are written for all identified critical tasks. By virtue of the hazard or complexity associated with critical tasks, it is paramount that the SOP be followed as written. SOPs contain a listing of high-level hazards associated with the task, for detailed hazard analysis reference the applicable Task Hazard Assessments. SOPs do not replace the requirements contained in the company Standards, Codes, and Processes nor does it replace the need to comply with required legislation. Section 8.0 references documentation that the worker shall understand before work commences.

1.0 PURPOSE

- To establish a company standard to safely and effectively carry out work as it applies to air arcing (gouging metal).

2.0 SCOPE AND APPLICATION

- This document applies to all company Heavy Construction Mining operations. Ensure all site-specific requirements are being met or exceeded before performing the task.

3.0 HAZARDS AND CONTROLS

- Improper setup of welding and gouging equipment leading to equipment damage, electrical shock, and personal injury
    - Ensure the welding machine is correctly grounded. The welder (worker) must attempt to remain dry and insulated from all live electrical components to prevent electric shock.
    - Inspect and replace cables, plugs, and leads that show any signs of defects.
    - Use the correct size of cables and ensure all electrical connections are secure and clean.
    - Keep cables, connectors, and the surrounding work area clean and free of debris to prevent hazards and ensure safe operation.
- Hot slag and sparks burning clothing and/or skin.
    - Ensure all exposed skin is covered during welding. Do not wear metal jewelry or clothing with cuffs, open pockets, or loose features that could trap sparks.
    - Cover the exposed skin with task-specific FR coveralls capable of being closed to eliminate exposed skin, welder's gauntlets, a face shield that protects the chin and neck, as well as a leather coat, armlets, and chaps, as required by the position of the work.
    - Make sure underclothing and coveralls are free from oil and other potential fire accelerants.
    - Position the body to avoid hot slag and sparks from contacting it.
- Hot slag and sparks burning combustible materials.
    - Clear the work area of all combustible and flammable materials where sparks or slag may land.
    - Inspect the ground to ensure it is free of oil, grease, or absorbent substances. Use welding blankets as necessary to create a safe working surface.
    - When working near equipment with fire suppression systems, verify that the system is deactivated and all sensing wires are protected from spark and slag exposure.

- Use welding curtains to contain the sparks and slag.
- Ensure a fire extinguisher is present, fully charged, and immediately accessible during hot work operations.

- Irritating the respiratory tract and poisoning the body.
  - Perform welding tasks in a well-ventilated area. Use air movers, smoke eaters, and fume extractors to maintain proper air circulation and minimize exposure to hazardous fumes.
  - Use a respirator with cartridges rated for welding fumes, copper fume, synthetic and natural graphite, and carbon black. A PAPR (Powered Air-Purifying Respirator) may also be used.

    Note: Some clients may require the use of a PAPR respirator for specific tasks. If you are unsure, consult with your supervisor before starting work.

- Concrete and water exploding from being superheated.
  - Cover concrete surfaces with a steel plate or fire-resistant blanket to prevent contact between molten slag and the concrete.
  - Eliminate standing water in any area where molten slag may land to reduce the risk of steam explosions or splatter.
  - Ensure the welder is insulated and remains dry. Do not perform welding operations in wet conditions or when exposed to live electrical components.

- Compressed gas cylinder damage and explosion due to heat.
  - Ensure cylinders are positioned safely away from slag hazards. They must be removed from any area where they could be exposed to molten metal, spatter, or high-heat debris.
  - Protect gas cylinders from heat, impact, and electrical arcs. Ensure each cylinder is properly insulated, securely fastened, and positioned to prevent tipping. Do not use any cylinder that appears damaged or defective.
  - When not in use, ensure all cylinders are secured and regulators are removed.

- Damaged hearing due to the high levels of noise.
  - In most situations, double hearing protection is required for air arcing. If noise levels and exposure times exceed worker occupational exposure limits (OELs), appropriate hearing protection must be worn. Follow up with supervision if unsure what type of hearing protection will be required.
  - All other workers in the area must be aware of the work and the necessity of wearing hearing protection.
  - Use barricade tape to close off the area where the work is taking place and place signs or tags to alert others to the loud noise levels and the requirement for hearing protection.

- Eye injury from welding flash.
  - Wear a welding helmet equipped with a filter plate of the appropriate shade to protect your eyes and face from harmful light and radiation.
  - Use welding curtains to protect bystanders or observers.

4.0 CHECKLIST

- ☐ Attend all preparatory meetings (IE, daily PSI; job scope; review of JSAs and SOPs for the job).
- ☐ Complete FLRA cards before starting work.
- ☐ Ensure all personnel involved in the task are aware of the hazards and the controls to be used, as identified in the SOPs, JSAs, and FLRAs.
- ☐ Conduct a pre-job inspection of all equipment to be worked on and tools to be used.
- ☐ **Standard of Training required for working on this job: On-the-job training.**

5.0 DEFINITIONS

5.1 Company

Means North American Construction Group Ltd. (NACG) and all directly or indirectly owned subsidiary companies, including joint ventures.

5.2 Company Personnel

Includes the Company's employees, officers, directors, agents, associates, consultants/contractors, temporary employees, and third-party processors.

5.3 HSE

Refers to the Health, Safety & Environment department.

5.4 Air Arcing

Air carbon arc cutting, also referred to as metal arc gouging and previously known as air arc cutting, is an arc cutting process in which metal is cut and melted by the heat of a carbon arc. A blast of air then removes molten metal. It employs a consumable carbon or graphite electrode to melt the material, which is then blown away by an air jet.

6.0 PROCEDURE

6.1 Preparation for Air Arcing

1) Complete a hazard assessment (i.e., FLRA) for the task. Follow up with supervision if unsure of the task or if there are hazards outside of the worker's control.
2) Inspect all tooling, PPE, welders, and compressed gas cylinders. Tag out and remove from service any item that is defective or damaged. Follow up with the supervisor.
3) Remove or cover combustible/flammable materials from the zone where the sparks and slag will land.
4) Confirm the fire suppression system has been disarmed or disabled. Follow up with supervision if it has not been. Protect fire suppression system sensing wires from spark and slag damage if working near the system on equipment.
5) Clear the work surface of unneeded materials and wipe up greases or oils. Ensure there are no oil, grease, absorbent, or other combustibles/flammables below into which slag could fall and ignite.
6) If the area to be gouged is restricted or confined, evaluate the body position and where the slag will go to ensure it does not fall on the body.
7) Confirm a fire extinguisher is in the work area and easily accessible.
8) Set up welding curtains around the work area to shield bystanders and observers from sparks, slag, and intense light. Advise others in the area that air arcing will be done. Let them know about the slag, the noise, and the fumes.

9) Inspect the gun, electrical leads, and the airline to ensure they are in good condition. Protect the fittings so they are not exposed and will not come into contact with the ground.
10) Verify you are using the correct rod.
11) Unspool your cables to prevent them from overheating.
12) Isolate the area by restricting entry using barricade tape or barriers to close off the area where the work is taking place. Place signs or tags indicating that it is an air-arcing task and to prevent unauthorized personnel from entering.
13) Protect the concrete floor by placing a steel plate on the affected area.
14) Ensure compressed gas cylinders are securely stored.

6.2 Air Arcing

1) Lightly strike the electrode tip on the workplace surface to initiate the arc.
2) Ensure the air stream is directed at the arc from behind the electrode and sweeps under the electrode tip.
3) Determine the direction of the line of travel for the spark when you begin. While gouging, periodically recheck the sparks' line of fire and ensure all combustible and flammable materials remain covered.\
4) Hold the torch so that the carbon electrode slopes back from the direction of travel with the air blast blowing past the tip of the electrode to evacuate the molten metal.
5) Let the arc start and slowly move it forward or side to side as needed to accomplish the goal.
6) Keep skin and body parts away from hot surfaces; keep feet and body out of the line of fire so that sparks and slag do not blow back or fall onto the worker.
7) The diameter of the electrode determines the width of the groove.
    a. Oscillating the electrode in a circular or restricted weave motion during gouging can significantly increase the gouging width. This is useful for removing a weld or plate imperfection that is wider than the electrode itself. It is essential that the weave width not exceed four times the electrode diameter.

8) Depth is dictated by the angle of the electrode to the workpiece and the rate of travel.
    a. A low electrode angle produces a shallow groove and allows the tool to travel at relatively high speeds.
    b. A steep angle results in a deep groove and requires a slower travel speed. Note that a steeply angled electrode may lead to carbon contamination.

9) Always use a push technique with air carbon-arc gouging. Continue moving forward with the air blowing from behind the arc. Never back up.
10) When back-gouging a weld joint, focus on the joint line, which is visible just in front of the carbon electrode. This allows you to follow the weld seam. To better control gouging results, hold your head behind the arc.
11) Chip slag. Using a hammer and chisel, chip hot slag from the area, making sure the slag is directed away from you. Refer to 960C-SOP-504 Use of Hand Tools.
12) Grind area. Using an angle or handheld grinder, grind the surface. Refer to 960C-SOP-502 Safe use of Grinders.
13) Take microbreaks and continually reassess the job for potential hot spots.
14) Repeat steps. Sweep up slag and metal to keep the work area tidy.

7.0 NOTES

If this task is to be done by a method different than described in this SOP, the work must **STOP,** and the alternate method must be **DOCUMENTED** with an adequate hazard assessment tool such as a JSA. The document must be **APPROVED** by a supervisor before such procedures are implemented.

8.0 REFERENCES

- Alberta Occupational Health and Safety Act, Regulation and Code 2021 – {Part 16, Sections 216, 217, 218, 222, Noise Exposure}
- Alberta Occupational Health and Safety Act, Regulation and Code 2021 – {Part 10, Sections 162, 164, 165, 169, 171,172, 173, 174, Fire and Explosion Hazards}
- Alberta Occupational Health and Safety Act, Regulation and Code 2021 – {Part 25, Sections 375, Tools, Equipment, and Machinery}
- 950C-C-007 Compressed Gas Cylinders Code
- 950C-C-028 Hazardous Energy Isolation Code
- 950C-C-031 Hot Work Code
- 960C-SOP-305 Compressed Gas Cylinders Handling and Storage
- 960C-SOP-307 Hot Work by Welders
- 960C-SOP-502 Safe use of Grinders
- 960C-SOP-504 Use of Hand Tools

9.0 APPENDICES

No appendices.