AIR ARCING (GOUGING METAL)

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Rev	**Status**	**Rev. Date**	**Status Description**	**Prepared by**	**Reviewed by**	**Approved by**

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 set up of welding and gouging equipment leading to equipment damage, electrical shock, and personal injury
    - Make sure welding machine is properly grounded. Welder should be insulated from live electrical parts and dry.
    - Inspect and replace cables, plugs, and leads that show any signs of defects.
    - Make sure all electrical connections are tight and clean.
    - Use the correct size of cables.
    - Make sure the cables, connectors, and work area are clean and free of debris.
- Hot slag and sparks burning clothing and/or skin.
    - Make sure any exposed skin is covered during the welding process. Do not wear metal jewelry or clothing with cuffs and/or pockets.
    - Cover the exposed skin with task specific FR coveralls capable of being closed to eliminate exposed skin, welder's gauntlets, face shield that protects the chin and neck, as well as leather coat, armlets, 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.
    - Organize the work area to remove combustible/flammables from the area where the sparks and slag will land.
    - Make sure there is no oil or absorbent on the ground
    - Cover materials with welding blankets if necessary.

- If working near fire suppression systems on equipment, ensure the system has been disabled and protect all sensing wires from spark and slag damage.
- Use welding curtains to contain the sparks and slag.
- Verify that a fire extinguisher is nearby, charged, and instantly available.

- Irritating the respiratory tract and poisoning the body.
  - Complete task in a well-ventilated area, use air movers, smoke eaters, and welding fume extractors to maintain quality air circulation.
  - Wear a respirator with cartridges for weld fume, copper fume, synthetic and natural graphite, and carbon black. Alternatively, a PAPR respirator may be used. Review worksite expectations as some clients may require PAPR respirators for the task. If unsure, check with supervision.

- Concrete and water exploding from being superheated.
  - Cover concrete surfaces with steel plate or fire blanket to prevent the molten slag from landing on concrete.
  - Remove standing water where molten slag may land.
  - Welder must be insulated from live electrical parts and dry. Do not weld when wet.

- Compressed gases cylinder damage and explosion due to heat.
  - Remove cylinders from the line of fire for the slag.
  - Protect gas cylinders from excessive heat, mechanical shocks, and arcs. Ensure cylinder is insulated and fastened so it will not fall. Do not use a compressed gas cylinder that appears to be damaged and/or defective.
  - Verify bottles are secured and regulators are taken off when not in use.

- 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 need for hearing protection.
  - Use barricade tape to close off the area where the work is taking place and place signs/tags to let others know there is loud noise levels and that hearing protection is required.

- Eye injury from welding flash.
  - Wear welding helmet with correct grade filter plate.
  - Use welding curtains to protect bystanders or observers.

4.0 CHECKLIST

- ☐ Attend all preparatory meetings (IE: daily PSI; job scope; review of JSA's and SOP's for the job).
- ☐ Complete FLRA cards before starting the work.

- ☐ Ensure all personnel involved in the task are aware of the hazards and the controls to be used, as identified in the SOP's; JSA's; and FLRA's.
- ☐ 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 as air arc cutting, is an arc cutting process where metal is cut and melted by the heat of a carbon arc. Molten metal is then removed by a blast of air. 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 task or if there are hazards outside of the worker's control.

2) Inspect all tooling, PPE, welder, and compressed gas cylinders. Tagout and remove from service any item that is defective or damaged. Follow up with supervisor.

3) Remove or cover combustible/flammable materials from the zone where the sparks and slag will land.

4) Confirm 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) 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 air line to ensure they are in good condition. Protect the fittings so they are not exposed and will not go to 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 / tags to note it is an air arcing task and to prevent entry by unauthorized personnel.

13) Protect concrete floor by placing steel plate on affected area.

14) Ensure compressed gas cylinders are secure from movement.

6.2 Air Arcing

1) Lightly strike the electrode tip on the workplace surface to initiate the arc.

2) Make sure the air stream is directed at the arc from behind the electrode and sweeps under the tip of the electrode.

3) Determine the direction of line of travel for the spark when you begin. While gouging, stop periodically to recheck the sparks' line of fire while double checking to see if all combustible/flammable materials are still 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 width of groove is determined by the diameter of electrode.

    a. Oscillating the electrode in a circular or restricted weave motion during gouging can greatly increase gouging width. This is useful for removal of a weld or plate imperfection that is wider than the electrode itself. It is important, however, that weave width should not exceed four times the diameter of the electrode.

8) Depth is dictated by the angle of electrode to the workpiece and rate of travel.

    a. A low electrode angle will produce a shallow groove and can travel at relatively high speeds.

b. A steep angle results in a deep groove and requires slower travel speed. Note, a steeply angled electrode may give rise to carbon contamination.

9) Always use a push technique with air carbon-arc gouging. Move forward continuously 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 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.