COLD WEATHER STARTING OF DIESEL POWERED EQUIPMENT

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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 cold weather starting of diesel powered equipment.

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

- Fire hazard from ether, portable heaters, and sparks from batteries.
    - Check for leaks and clean up oil and fuel spills.
    - Inspect all cables and connections, ensure electrical wires have not been rubbed/chaffed through and exposed.
    - Check portable heaters a minimum of every two hours while warming equipment.
    - Review 950C-C-002 Battery Charging and Servicing Code.
- Contacting equipment with service trucks and/or light vehicles.
    - Use a spotter in congested areas or areas of low visibility.
- Slip, trip and fall hazards from uneven and slippery ground.
    - Always use three-point contact when mounting and dismounting equipment.
    - Observe ground conditions and choose the best path. Avoid walking on lumps and rocks.
    - Wear traction aids in winter months.
    - Keep work area organized and housekeeping in order.
- Electrical hazards from cords.
    - Inspect cords for damage; ensure cord has ground pin; and proper breaker for amperage. Tagout and remove from service any damaged or defective cords. Report to supervision.

- Uncontrolled movement of equipment.
    - Ensure equipment has been locked out at all times while the portable heaters are being placed. Ensure a crossover lock has been placed on the equipment while it is left unattended to warm up.
- Entanglement hazard from tarps.
    - Ensure tarps or parachutes have been removed from crankshaft area prior to starting.
- Engine damage from using ether.
    - Cold starting using ether shall only be completed by competent personnel under the approval of supervision.
    - Ether starting aid injection systems must be used when equipped. Reference the OEM specific manual or procedure for the correct use.
    - Do not use ether unless required at low ambient temperatures. Lower than minus 15 degrees Celsius.
    - Only spray ether with the engine turning over. If you fill the inlet manifold with ether the detonation will cause excessive peak cylinder pressure and potentially cause severe damage.
    - Limit spray to short bursts until engine fires and produces white smoke – then stop the spray.
    - Two people task – one to spray and one to crank the engine.
    - Ether cans should be at room temperature. This is to allow atomization of the fluid.

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.

6.0 PROCEDURE

This procedure is to be used to heat equipment hydraulics, transmission and powertrains prior to starting in extreme cold temperatures. Refer to Appendix A – Guidelines on Starting Equipment in Cold Temperatures for more information.

1) Conduct a hazard assessment (i.e. FLRA) prior to the task. Notify supervision if unsure of task and if there are any hazards outside of the worker's control.

2) Conduct pre-use equipment inspection of all tools and equipment including but not limited to service truck, portable heater and battery charger. Tagout and remove from service any damaged or defective tools and equipment, notify supervision.

3) Isolate hazardous energy. Ensure equipment is shut down and locked out; wheel chocks and park brake is set.

4) Using a spotter, position portable heater near equipment to be started.

5) Tarp or parachute over engine and run one hose from hotbox to engine.

6) Run one hose to the hydraulic pump.

7) Install battery charger onto batteries and plug charger in.

8) Note: Mechanical Caterpillar trucks need to have the transmission filter housing and transmission heated with hotbox prior to starting. Komatsu trucks need to have the hydraulic filter housing heated. If this is step is not done there is a chance that the filter housing will blow off.

9) Remove personal locks and install crossover lock with tag. Heat for approximately six (6) to eight (8) hours. Check portable heaters a minimum every two hours for leaks and potential fire hazards.

10) Return to equipment, remove crossover lock and install personal lock. Check all fluid levels to confirm they are at acceptable levels.

11) Remove tarp or parachute from crankshaft area to prevent entanglement in fan.

12) Have a ground person in place to watch under and around the equipment being started. Ground person will remain in visual contact with operator in cab.

13) Turn ignition key on and listen for pre-lube pump to run the cycle. If pre-lube does not run, notify supervision. Pre-lube should be repaired before continuing to start.

14) If all systems check out, start engine.

15) Once engine starts, ground person will visually check under the equipment for leaks, and any indication of a problem. Employee starting the equipment does not leave the cab until the ground person indicates all systems are clear and ground person stays in visual contact with equipment operator at all times.

16) When employee is exiting cab they must visually ensure that the park brake switch is applied/control lever is in park position, and the dash and exterior park brake lights are illuminated.

17) Lockout propel and remove all heating equipment. Notify supervision that the equipment is up.

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

- 950C-C-028 Hazardous Energy Isolation Code
- 950C-C-002 Battery Charging and Servicing Code
- 960C-SOP-101 Portable Heaters
- 960C-SOP-104 Hoarding Enclosures

9.0 APPENDICES

- Appendix A – Guidelines for Starting Equipment in Cold Temperatures
- Appendix B – Portable Heater Set Up

Appendix A Guidelines for Starting Equipment in Cold Temperatures

Summary of NACG & Manufacturer Cold Weather Recommendations for Equipment

		Cold Start Requirements:					
Air Temperature Range (ignore wind chill)	Idle Machine at Night?	Heat Engine before Starting?	Approximate engine warm up time after heating and starting?	Tarp & heat hydraulics, transmission & powertrain?	Approximate time to simultaneously exercise the Hydraulics, Transmission & Powertrain while the engine warms. (Run engine at less than 1/3 of full throttle)	Operate under a light load until the systems reach normal operating temperatures?	'Light Loading' due to extreme cold after the machine is at normal operating temperatures? (To help prevent brittle failures in steel)
Warmer than -15C	Turn off engine. Do not idle. Contact the site maintenance team if the machine will not start.	Engine heating not required. If equipped, use engine coolant heater to minimize engine wear.	3 minutes	Not required	1 minute	Yes	No
-15C to -20C	Turn off engine. Do not idle. Contact the site maintenance team if the machine will not start.	Engine heating not required. If equipped, use engine coolant heater to minimize engine wear.	4 minutes	Not required	2 minutes	Yes	No
-20C to -25C	Idling may be required if not equipped with an engine coolant heater.	Engine will require heat to start. Use engine coolant heater or other heating method to start engine.	6 minutes	Not required	3 minutes	Yes	No
-25C to -30C	Idling may be required if not equipped with an engine coolant heater.	Engine will require heat to start. Use engine coolant heater or other heating method to start engine.	8 minutes	Discuss the specific machine with the site maintenance superintendent.	4 minutes	Yes	No
-30C to -35C	Idle engine at night if required the next shift.	Engine will require heat to start. Use engine coolant heater or other heating method to start engine.	10 minutes	Yes	5 minutes	Yes	Yes
Colder than -35C	Idle engine at night if required the next shift.	Engine will require heat to start. Use engine coolant heater or other heating method to start engine.	15 minutes	Yes	7 minutes	Yes	Yes

1) Contact the site maintenance superintendent if you have questions.
2) Gasoline powered equipment (pickup trucks) are never idled longer than what is required to keep the windows defrosted. (~10 minutes).
3) Contact the site maintenance team if the engine coolant heaters (Proheat/Wabasto/Espar) are not working.

Appendix B Portable Heater Set Up

Engine Oil Warm Up:

Set up for Hydraulic Tank: