

**March 23, 2022**
**Fired and Flameless Heaters**
**PURPOSE/APPLICATION**

Strike shall attempt to minimize risks to personnel, equipment, and property by conducting operations that require the use of climate managed work areas or in remote locations that require supplemental heating (e.g., keeping piping heated for coating). There are three common types of industrial heaters on the market for large-scale industrial projects; direct fired, indirect fired, or flameless heaters.

This practice is intended to provide best practices for the use and care of portable and trailer mounted heaters. Each heater manufacturer has different operation instructions. The operator is responsible to review them as part of task specific HIAC before starting the task.

**PPE**

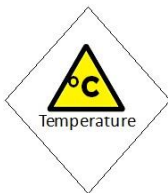
- Strike minimum requirements
- Additional PPE as determined by the SDS for fuel source and/or hazard assessment

**TRAINING**

- Strike and Site-Specific Requirements
- WHMIS 2015
- Transportation of Dangerous Goods (TDG) (as required)

**HAZARDS & CONCERNS**

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| <ul style="list-style-type: none"> <li>▪ Fire/Explosion</li> <li>▪ Extreme cold</li> <li>▪ Oxygen deficiency</li> <li>▪ Pressure cylinders</li> <li>▪ Property damage</li> <li>▪ Personal injury/Burns</li> </ul> | <ul style="list-style-type: none"> <li>▪ Spills</li> <li>▪ Traffic/Worksite Congestion</li> <li>▪ Hazardous/Explosive Atmospheres</li> </ul> |
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**PRECAUTIONS**

- When a flammable gas or flammable liquid is handled, used, or stored, all sources of ignition must be eliminated or adequately controlled. Possible ignition sources include open flame, spark-producing mechanical equipment, welding and cutting processes, smoking, static discharge and any electrical equipment or installation that is not approved for hazardous locations, as specified by the Electrical Safety Act.
- When using heaters with a combustion engine or burner to generate heat, a high level of care must be taken during the refueling process. Ensure the fuel does not splash on the heating elements or engine exhaust. It is important that workers performing fueling operations are familiar with SWP 31 Fueling.
- When working with Liquid Propane Gas (LPG)/Natural Gas (NG) fueled heaters, workers who are assessing the placement of fuel tank need to ensure the connecting hoses are properly rated as per SWP 12 Compressed and Liquefied Gas and SWP 35 Propane Cylinders and Torches.
- When working with fired heaters or near flammable and combustible liquids, ensure an appropriate classed fire extinguisher (typically ABC) is readily available.
- Workers using heaters for warming of hoardings are required to inspect and monitor enclosed

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areas for the development of a flammable or explosive atmosphere. If a worksite atmosphere is at a level that is more than 10% of the lower explosive limits (LEL), atmospheric testing results must be reassessed, and hazard controls implemented before a worker enters the hoarding.

- No worker shall undertake any servicing or maintenance of a fired heater while it is in operation or a flammable liquid, gas or explosive substance is present within 5 meters.
- If an internal combustion engine of heater unit is in a hazardous location, ensure it has a combustion air intake and exhaust discharge lines. The lines must be:
  - (a) Equipped with a positive air shut down device for diesel engines, or
  - (b) Equipped with a flame arresting device, or
  - (c) Located outside the hazardous location.

**GENERAL DO'S AND DON'TS**

**Review all Original Equipment Manufacturer (OEM) warnings prior to use. OEM warnings are found on the heater unit or in the operator manual. The following is an example of an OEM warning:**

**NEVER LEAVE THE HEATER UNATTENDED WHILE BURNING!**

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| <p><b>⚠WARNING:</b><br/>YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS, SO PLEASE READ THESE INSTRUCTIONS BEFORE YOU OPERATE THIS HEATER.</p> <p><b>⚠GENERAL HAZARD WARNING:</b><br/>FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS HEATER, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK. ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS HEATER.<br/>IF YOU NEED ASSISTANCE OR HEATER INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.</p> | <p><b>⚠WARNING:</b><br/><b>CARBON MONOXIDE CAN KILL YOU</b><br/>NOT FOR HOME OR RECREATIONAL VEHICLE USE, USING A PORTABLE HEATER IN AN ENCLOSED AREA CAN PRODUCE DEADLY CARBON MONOXIDE.</p> <hr/> <p><b>⚠WARNING:</b><br/>FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE HEATER AS RECOMMENDED BY THE INSTRUCTIONS. NEVER USE THE HEATER IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.</p> |
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**THE DOs**

- DO** Take time to familiarize yourself with the controls and instructional placards before operating.
- DO** Contact your dealer or rental service provider if additional training is necessary.
- DO** Follow all Strike transportation, load securement and trailer management SWPs.
- DO** Review OEM short term and long-term storage requirements if placing units into storage for periods longer than 48 hrs.
- DO** Read all instructions, warnings, and precautions provided by the manufacturer before operating.
- DO** Carefully inspect all components for damage incurred during shipping.
- DO** Position the heater in an area with stable footing and/or on a work area able to support the workers and unit's weight.

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- DO** Take time to read the manual and discuss safe practices with worksite personnel, seek training as needed.
- DO** Keep heater compartment doors closed during machine operation.
- DO** Disconnect NG/LPG heaters from fuel source or tank when storing the heater indoors.
- DO** Only have trained service technicians service the machine.
- DO** Properly shutdown the machine and let it cool completely before attempting to transport or service any component of the heater.

#### THE DON'Ts

- DON'T** Allow untrained personnel to operate or service the machine. Take time to read the manual and discuss safe practices with worksite personnel, seek training as needed.
- DON'T** Use plugs or cords that show signs of damage (e.g., broken/cracked insulation, damaged terminals, etc.).
- DON'T** Ever override any safety devices.
- DON'T** Transport or move the machine while it is running.
- DON'T** Use the heater in a space where gasoline or other liquids having flammable vapors are stored or used.
- DON'T** Allow the heater to discharge within 20 feet (6M) in the direction of any propane gas container.
- DON'T** Operate the unit in partly ventilated areas without a flue pipe connected to the unit.
- DON'T** Attempt to operate this machine indoors. Exhaust fumes from the engine and heater can kill.
- DON'T** Try to light appliance if you smell gas or fuel.
- DON'T** Substitute a manufactured heater unit for home built alternative (e.g., placing a torch into a scrap pipe in efforts to heat a hoarding).

#### **GENERAL START UP SAMPLE STEPS** (\*Always refer to OEM Guidelines)

TO START HEATER UNIT WITH AUTO IGNITION CONTROL:

1. Ensure unit is on flat, level ground before starting. Ensure the canopy and fan guards are closed.
2. Flip switch to "OFF" position.
3. Check fuel level (2-4 gallons to start).
4. Plug in supply cord to 115 volt outlet.
5. Flip switch to "MANUAL" position.
6. For thermostat operation flip switch to "THERM" position.
7. There will be a 5 second safe start check, a 15 second pre purge and then the burner will fire.

IF HEATER FAILS TO START:

1. Press manual reset button on the burner relay.
2. Check for low voltage condition and 115 volt supply.
3. Check fuel filter, suction tubing, and nozzle assembly.

#### **\*Note: Always follow OEM Guidelines**

**If unit has been reset a few times without ignition there will be an accumulation of oil in the combustion chamber, to correct this, do the following:**

1. Make sure the unit is sitting on level ground to ensure excess oil drains out of secondary exchanger (via small drain hole located on outer shell of the heat exchanger by the burner end).
2. Allow unit to drain for 15-20 minutes or until all the oil has drained out.
3. Upon ignition, excessive amounts of smoke will be present. This will persist until all excess oil has been burnt from the heat exchanger.

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4. When the unit has stabilized and the burner is set up to operate properly, shut off the switch. Let the fan cool down the chamber and stop.

**HEAT DUCTING**

**THE DOs**

- DO** Place the ducts in a manner to prevent tripping hazards.
- DO** Remove outer layers of clothing as required to prevent over heating or heat exhaustion.
- DO** Manage the temperature in the hoarding by removing ducts or opening the ends of the hoarding/work area.
- DO** Monitor the O<sup>2</sup> and CO levels in the hoarding/work area.
- DO** Complete a hazard assessment of the activities being completed in the hoarding/work area that may be affected by the heat (e.g., coating material, acetone/isopropyl).
- DO** Allow fresh air to enter the hoarding/work area.

**THE DON'Ts**

- DON'T** Connect the ducts until the heating unit has warmed up and burning cleanly to prevent unburned fuel entering the hoarding/work area
- DON'T** Run the ducts down the access stairs into the ditch or entry points of the hoarding/work area

**Look for OEM charts for maximum allowable duct lengths, below is a sample of a chart:**

| <b>MAXIMUM ALLOWABLE DUCT LENGTHS</b> |                             |                              |
|---------------------------------------|-----------------------------|------------------------------|
| 12" or 16" outlet ducting             |                             | 16" inlet ducting            |
| 100 feet 2 x 12" outlet ducting       | 100 feet 16" outlet ducting | w/ 0 feet 16" inlet ducting  |
| 75 feet 2 x 12" outlet ducting        | 75 feet 16" outlet ducting  | w/ 25 feet 16" inlet ducting |
| 50 feet 2 x 12" outlet ducting        | 50 feet 16" outlet ducting  | w/ 50 feet 16" inlet ducting |

**DEFINITIONS**

**Direct fired heaters** work with a burner that provides hot gasses, which then transfer heat energy to a process liquid or gas flowing directly through coils installed inside the heater vessel. The exhaust gas from this fuel combustion is expelled directly into the heated air. A major setback to direct-flamed heaters is the air pollution they emit.

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**Direct Flame Heaters Propane and Oil/Diesel Fuel Models:**



**\*Note: This style of heater is not acceptable for use in areas of potential flammable vapors, gases, or solids. They also require continuous Fire/Spark watch personnel present for monitoring.**

**Indirect Fired Heaters** were created to contest the negative effects of direct fired heaters. Both direct and indirect fired heaters are based on the same traditional platform, but the exhaust of indirect fired heaters is vented to outside air instead of entering the heated air.

Although indirect fired heaters improve the quality of air in a space, the downside is a significant amount of heat is lost from the exhaust by venting to the outside. Another downside is that far more fuel is needed to deliver the same BTUs. This results in increased fuel costs and higher emissions.

**Indirect Fired Heaters Propane and Oil/Diesel Fuel Models:**



**Flameless heaters** true to their name, create heat without a flame, meaning **the heater has a much lower risk of being a source of ignition for worksite fires, making them ideal for volatile worksite environments.**

A flameless heater operates by using diesel fuel to agitate hydraulic oil in a flameless, sparkless, low-pressure environment. The combustion in a flameless heater takes place entirely within the confines of the combustion chamber, similarly to a reciprocating piston engine. Because the diesel turns into vapor before combustion, there are no fuel droplets to burn, only gaseous fuel. Therefore, the vapor inside the flameless heater burns cleanly and completely, resulting in low CO<sub>2</sub> emissions.



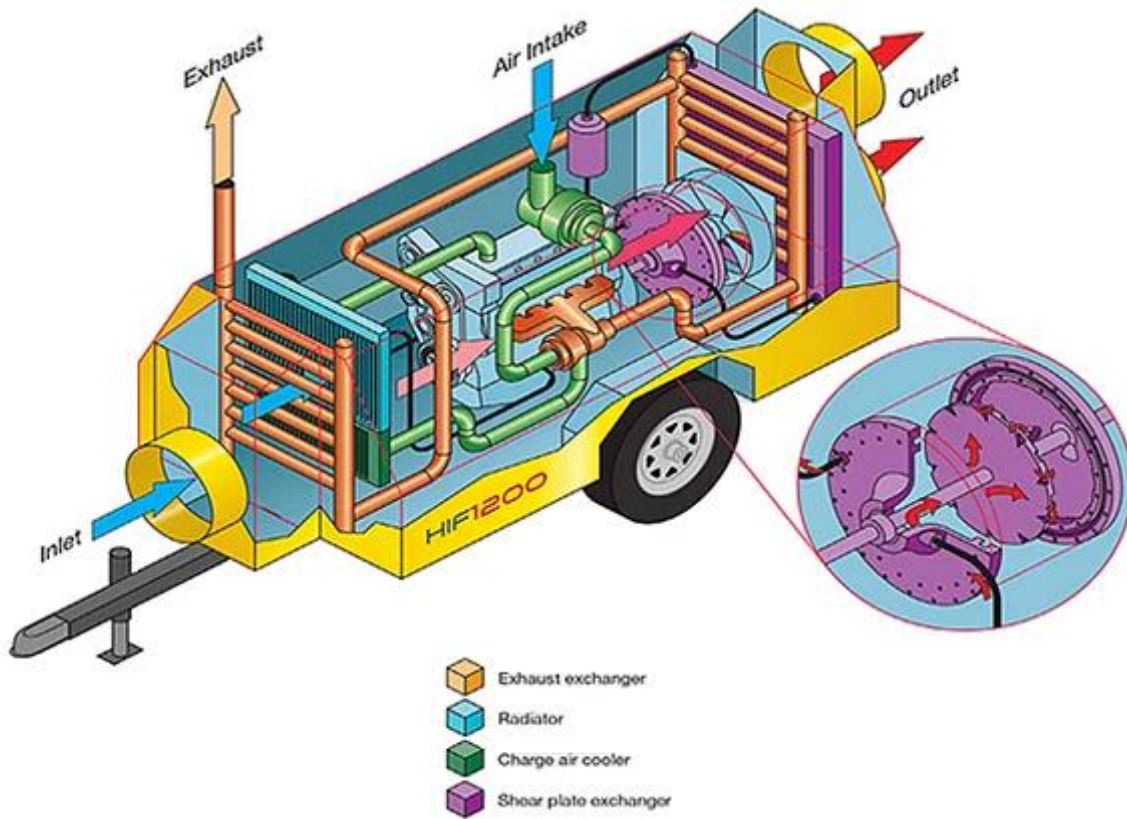
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Flameless Heater Model:



Flameless Heater Sample Operation:





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**REFERENCES / ADDITIONAL INFORMATION**

**OEM Manual links used for reference**

[WWW.FROST-FIGHTER.COM](http://WWW.FROST-FIGHTER.COM)

[www.equipmentsourceinc.com](http://www.equipmentsourceinc.com)

[www.hermannelson.com](http://www.hermannelson.com)

[www.mrheater.com](http://www.mrheater.com)

**Strike SWP's**

- SWP 12 Compressed and Liquefied Gas
- SWP 31 Fueling
- SWP 35 Propane Cylinders and Torches Name of Reference

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|---------------|-----------------------------------|---------------------------|-----------------------------|
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|               | 5. <u>Brian Bruce</u>             | _____                     | Date: <u>Dec 22, 2021</u>   |
| Approved by:  | 1. <u>Corporate HSE Committee</u> | _____                     | Date: <u>March 23, 2022</u> |

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