

GUIDANCE DOCUMENT

Low Emission Thermal Processing of Munitions Constituents

Safe Operating Procedure for Propane-Fueled MPPEH Flashing Unit

ESTCP Project WP18-5038

OCTOBER 2019

Erik Tolmachoff
NAWCWD

Distribution Statement A
This document has been cleared for public release



REPORT DOCUMENTATION PAGE					Form Approved OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.						
1. REPORT DATE (DD-MM-YYYY) 08-10-2019		2. REPORT TYPE ESTCP Guidance Docuemnt			3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Low Emission Thermal Processing of Munitions Constituents: Safe Operating Procedure for Propane-Fueled MPPEH Flashing Unit				5a. CONTRACT NUMBER		
				5b. GRANT NUMBER		
				5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Erik Tolmachoff				5d. PROJECT NUMBER WP18-5038		
				5e. TASK NUMBER		
				5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) NAWCWD 1 Administration Circle China Lake, CA 93555					8. PERFORMING ORGANIZATION REPORT NUMBER WP18-5038	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Environmental Security Technology Certification Program 4800 Mark Center Drive, Suite 16F16 Alexandria, VA 22350-3605					10. SPONSOR/MONITOR'S ACRONYM(S) ESTCP	
					11. SPONSOR/MONITOR'S REPORT NUMBER(S) WP18-5038	
12. DISTRIBUTION/AVAILABILITY STATEMENT DISTRIBUTION STATEMENT A. Approved for public release: distribution unlimited.						
13. SUPPLEMENTARY NOTES						
14. ABSTRACT This report explains how to safely operate the propane - fueled burner at Naval Air Warfare Center Weapons Division (NAWCWD) China Lake's Mini Deck facility. The operational procedures will be the same for demonstration at Indian Head's Caffee Road Thermal Decontamination Area (CRTDA), though some specifics such as the fuel tank, points of contact, emergency contacts, and specific safety procedures set by CRTDA will differ. Fire Science has designed and built a large, modular, propane - fueled burner designed to thermally decontaminate large - scale MPPEH (material potentially presenting an explosive hazard). Testing of this device will be performed at China Lake's Mini Deck facility in order to demonstrate that the technology can meet the requirements for large scale MPPEH thermal decontamination (i.e., safety "flashing") and also to understand the energy and costs savings of this technology.						
15. SUBJECT TERMS Low Emission Thermal Processing, Munitions Constituents, Safe Operating Procedure, Propane-Fueled MPPEH Flashing Unit						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UNCLASS	18. NUMBER OF PAGES 8	19a. NAME OF RESPONSIBLE PERSON Jeanne Hartzell	
a. REPORT UNCLASS	b. ABSTRACT UNCLASS	c. THIS PAGE UNCLASS			19b. TELEPHONE NUMBER (Include area code) 301-744-5629	

Safe Operating Procedure for Propane-Fueled MPPEH Flashing Unit

Introduction: This report explains how to safely operate the propane-fueled burner at Naval Air Warfare Center Weapons Division (NAWCWD) China Lake's Mini Deck facility. The operational procedures will be the same for demonstration at Indian Head's Caffee Road Thermal Decontamination Area (CRTDA), though some specifics such as the fuel tank, points of contact, emergency contacts, and specific safety procedures set by CRTDA will differ.

Location: This fire testing will be conducted at NAWCWD China Lake's "Mini Deck."

Purpose: Fire Science has designed and built a large, modular, propane-fueled burner designed to thermally decontaminate large-scale MPPEH (material potentially presenting an explosive hazard). Testing of this device will be performed at China Lake's Mini Deck facility in order to demonstrate that the technology can meet the requirements for large scale MPPEH thermal decontamination (i.e., safety "flashing") and also to understand the energy and costs savings of this technology.

Operator Positions and Descriptions:

- 1) Pipeline operator** - The pipeline operator's job is to inspect that all of the valves are initially off before burning, to open the valves in the proper sequence prior to ignition, and to turn the valves off in the proper sequence during shutdown.
- 2) Fire igniter operator (FIO)** - The FIO's job is to power on and off the cartridge heater igniter that provides the heat needed to ignite the burner.
- 3) Fuel controller** - The fuel controller will initiate, cease, and if necessary, adjust fuel flow to the burner. A globe metering valve can be used to control fuel flow rates on a dedicated fuel tank. If a propane delivery truck is used to deliver fuel, the fuel controller can adjust either the fuel pressure or flow rate of the truck's pump.
- 4) Operation Manager (OM)** - The OM is responsible for ensuring the fires are conducted in a safe and productive manner. Other than calling out an emergency shutdown, a procedure that anyone can perform, the OM is responsible for making all calls for safety and operating directives.

Safety Equipment

1. **Leather Gloves** – for all operators working in the burn area.
2. **Steel Toe Work Boots** – worn by every operator working in the burn area.

Set Up:

1. **Condition Check**– Check weather conditions to include: wind, temperature and relative humidity. The operation will not be carried out if wind speed exceeds 20 mph.
2. **Burn Areas** – The burner consists of a series of pipes that have nozzles along the length of the pipes. The burners are fixed in place and fed by a 3” pipeline. Between the pipes are sections of solid steel train tracks that can support the weight of objects being flashed in the fire without resting directly of the burner pipes. Other than the items being flashed, the burner will be mostly clear. The burner must never be covered with debris such as excessive wood or scrap metal as this can potentially lead to internal overpressures during startup.
3. **Pipeline** – The pipeline is 3” pressure-tested flanged pipe that connects the propane source to burner. The pipeline rests on risers to prevent corrosion. Along the line are: a pressure transducer, two quarter turn on/off valves and two flexible sections. All valves are to be closed prior to startup.
4. **Propane Tank** – There is a 15,000 gallon propane tank, equipped with internal failsafe valves and two emergency shutdown switches. Another propane tank that may be used is the propane truck that delivers fuel. The truck also has failsafe internal shutoff valves and emergency shutdown switches. The fuel tank is to be connected to the pipeline prior to startup with all pipeline valves closed.
5. **Burner integrity** – Prior to operation, the burner pipes must be visually inspected to ensure that they are in place and unbroken. This will prevent excessive flows of fuel from a missing nozzle or damaged pipe and also prevent the chance of flashback during ignition by eliminating any gaps larger than a flame quenching distance, approximately 2 mm.
6. **Item to be flashed** – There may be a large item flashed on the burner. The article will be placed by an extended boom forklift onto the elevated sections of train track designed to bear loads during the fire. Once the item is in place on the burner, thermocouples will be placed on the item. The item flashed can be moved by forklift no sooner than one hour after the burn is completed. A licensed heavy equipment operator must place the item on the burner
7. **Igniter** – The fire will be ignited by one or more cartridge heater. The igniters should not be powered on until approximately 1 minute before fuel flow begins.

They should remain powered on during burning. After fuel is shut off and the fire extinguishes due to fuel consumption, igniters should be immediately powered off.

Execution Processes (Step-by-Step):

1. The pipeline operator will confirm that all pipeline valves are closed.
2. The burner pipes and nozzle are inspected for damage. Cracks or breaks in pipes or missing or damaged nozzles must be repaired or replaced before operation.
3. If MPPEH or a surrogate will be flashed during operation, it will be placed by a skilled and licensed forklift operator onto the train rail supports. Care should be taken to rest the item on the support rather than the burner pipes.
4. After the pipeline and burner inspection and after the surrogate placement, the skirt will be placed around the perimeter of the burner(s) to be used. Igniters will be mounted through the skirts.
5. The pipeline operator will begin opening the pipeline, starting with the quarter turn on/off valve furthest downstream of the fuel tank (nearest the burn), followed by the valve just downstream of the tank.
6. The OM will inform the FIO to power on the igniters.
7. After approximately 1 minute, the fuel controller will initiate fuel flow.
8. When the objective has been met, the OM will inform the fuel controller to shut off the fuel supply. Once flow is stopped, the fire will gradually diminish in power.
9. Once flames are no longer visible, the FIO will power off the igniters. The pipeline operator will turn the valves to the off position, starting with the valve nearest the tank (reverse order of opening).
10. The OM will record the time of the last visible flame and begin a one-hour countdown/watch period during which the burner must not be approached.
11. Once it is determined that the burner has cooled and is safe to approach (thermocouple readings < 120 °F), the igniters and skirt may be stored away and any flashed items may be removed by a licensed heavy equipment operator.

Procedure for initiating, stopping fuel flow (specific to China Lake)

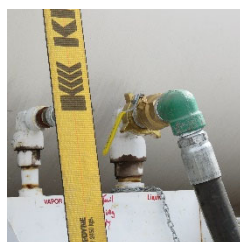
1. Open the tank.
 - a. Locate Emergency Shut-Down Switches. Switches are located on opposite ends of the steel frame. Pull switches to the out position. This will open storage tank internal valves



- b. Locate the 2" liquid supply valve. This valve will supply liquid propane to the liquid out connection located on the steel frame.
Note: Valve must be opened slowly. If valve is opened too quickly the internal valve located in storage tank may close due to excessive flow. A noticeable "click" will be heard if excess flow condition is achieved. See "Failsafe Trigger" at the end of this section for more details.



- c. Locate main liquid service valve on hose connection. This valve will supply liquid to the main 3" liquid line.



- d. Main 3" liquid supply valve is now ready to supply gas to customer burner. Take care when opening. Open valve slowly to avoid triggering the failsafe.
2. The OM will decide when to shut down the fire. The first process in shut down involves stopping fuel flow from the tank:
 - a. Close the main liquid supply valve.
 - b. Close the 2" liquid supply valve on the tank.

3. Pressure in the pipeline will drop over time as fuel burns. Once flames are no longer visible, the pipeline operator will
 - a. Close the 3" quarter turn on/off valve near the tank to the off position
 - b. Close the 3" quarter turn on/off valve at the Northeast edge of the Mini Deck to the off position.

Emergency Shut Down: In case of an emergency, or in the event that any team member decides it is necessary to stop the fire due to safety concerns, fuel supply to the burner should be stopped immediately. Fuel supply should be stopped by pushing one of the emergency shut-down switches on the tank and closing all approachable 3" quarter turn on/off valves, starting with whichever is nearest. In case of emergency shut-down the pipeline will likely store more fuel in it than is desirable. Pressures in the pipeline can be monitored using the pressure gauge immediately downstream of the first 3" quarter turn valve. If this pressure is excessive (> 150 PSI), the burner should be operated as soon as possible in order to substantially burn the residual fuel in the pipeline

Failsafe Trigger: If failsafe overflow protection on the tank is triggered, the appropriate course of action depends on the operator's judgement of the cause of the failsafe trigger. If there is any reason for concern from any team member, the operators must carry out "Emergency Shut Down" described above. If there is no perceived danger and the team agrees that the failsafe was triggered from opening the liquid control valve too quickly, operation can resume from step 7 of the execution process.

WARNING: Under no conditions will the propane-fueled fire be extinguished. Doing so could result in unburnt propane being released, causing a bigger hazard than if ignited.

Prior to all burns (China Lake specific):

1. Give Hazard Control Brief (HCB) to all participants and observers.
2. Have all participants read and sign the Operating Instructions (OI) and Hazard Control Brief.
3. Since large quantities of smoke are anticipated, notify Range Control.
4. If present, assign observers or visitors to a safe location for the burn. The safe distance from the fire will be marked by yellow railing at the deck.
5. Check weather conditions including wind, temperature and relative humidity. Do not carry out burn if there is a north or northeast wind to ensure propane gas or flames do not create a hazardous situation for personnel.
6. All operators will take their respective places to provide support in the job they have been provided. All job descriptions are explained in detail above.

1. Fuel Ignition Operator (FIO)
 2. Pipeline operator
 3. Operating Manager (OM)
 4. Fuel controller
7. OM will signal the pipeline operator to begin opening pipeline valves.
 8. OM will signal FIO to start the igniter(s).
 9. OM will signal the fuel controller to commence fuel delivery from the tank.
 10. When it is time to stop the burn, OM will signal to the fuel controller to stop fuel flow from the tank.
 11. When it is time to close the pipeline, the OM will signal to the pipeline operator to begin closing the pipeline.
 12. The OM will record the time of the last visible flame and begin a one-hour countdown/watch period during which the burner must not be approached.

Clean-Up (China Lake Specific):

1. After the last appearance of flames, monitor the burner for one hour to prevent any person from approaching a potentially hot area.
2. Put away any tools used during operation.
3. Once the burner is sufficiently cool (< 120 °F), any flashed items may be removed by a licensed heavy equipment operator.
4. Call Range Control and Range Scheduling upon completion of the burn.

Emergency Procedures (China Lake specific):

1. If there is an emergency where someone is hurt or if the base Emergency Personnel need to be called, everyone in attendance will be directed to the west side of Knox Road during the response. Operators will call Range Control to initiate these services, reporting the Mini Deck's five-digit building number. If Range Control cannot be reached, call 911 and state you are calling from NAWS China Lake and give the same info as stated above.