Decontamination of Explosives-Contaminated Range Scrap Using A Transportable Hot Gas Decontamination System

Final Implementation Guidance Manual

May 2003
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<tr>
<td>AEDA</td>
<td>Ammunition, explosives, or other dangerous articles</td>
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<td>APG</td>
<td>Aberdeen Proving Ground</td>
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<td>ATC</td>
<td>Aberdeen Test Center</td>
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<td>BCS</td>
<td>Burner Control System</td>
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<td>CRREL</td>
<td>Cold Regions Research and Engineering Laboratory</td>
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<td>Closed, Transferred, and Transferring</td>
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<td>Department of Defense</td>
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<td>DRMO</td>
<td>Defense Reutilization and Marketing Office</td>
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<td>ESTCP</td>
<td>Environmental Security Technology Certification Program</td>
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<td>OW</td>
<td>Operator Workstation</td>
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<tr>
<td>PEL</td>
<td>Permissible Exposure Limit</td>
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<td>PLC</td>
<td>Programmable Logic Controller</td>
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<td>Personal Protective Equipment</td>
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<td>RDX</td>
<td>Hexahydro-1,3,5-trinitro-1,3,5-triazine</td>
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<td>Standard Operating Procedures</td>
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<td>Site-Specific Health and Safety Plan</td>
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<td>TNT</td>
<td>Trinitrotoluene</td>
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<td>USAEC</td>
<td>U.S. Army Environmental Center</td>
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<tr>
<td>UXO</td>
<td>Unexploded ordnance</td>
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<tr>
<td>Yellow D</td>
<td>Ammonium Picrate</td>
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1.0 Introduction

This Implementation Guidance Manual has been prepared to assist Range Managers to conduct a low cost method for decontaminating explosives-contaminated range scrap using the Transportable Hot Gas Decontamination (HGD) System. Under management of the U.S. Army Environmental Center (USAEC), a low-cost HGD process configuration has been developed under the Environmental Security Technology Certification Program (ESTCP) for decontamination of explosives-contaminated range residue. In fall 2001, a full scale demonstration of the Transportable HGD System was conducted at the U.S. Army Aberdeen Test Center (ATC), located on Aberdeen Proving Ground (APG) Maryland, funded by ESTCP and the USAEC. This Implementation Guidance Manual provides procedures for installing and operating the Transportable HGD system, information for procurement of materials and equipment, cost information, site preparation requirements, procedures for relocating and dismantling the system, data collection requirements, and manpower requirements.

1.1 BACKGROUND

The Department of Defense (DoD) has numerous target, bombing, test, and firing ranges that have accumulated a substantial amount of high-value recyclable scrap metal, in the form of range residue. This scrap metal includes practice bombs, expended artillery, small arms and mortar projectiles, aircraft bombs and missiles, rockets and rocket motors, hard targets, grenades, incendiary devices, experimental items, demolition devices, and other materials fired on or upon a military range (See Figure 1.1-1). This material is collected in range sweeps and removal operations at active ranges, and Unexploded Ordnance (UXO) removal operations at Closed, Transferred, and Transferring (CTT) sites. Contrary to popular belief, these items often have explosives residue after detonation. Explosive incidents involving scrap metal from training and firing ranges have occurred over the years and more recently are under close scrutiny.

The DoD requires that range managers ensure that range residue does not contain ammunition, explosives, or other dangerous articles (AEDA) prior to release to the private sector for recycling. To accomplish this, each piece of range residue is visually inspected several times and certified as 100% free of explosives by range personnel before release for commercial recycling. Historical decontamination methods for firing range debris include open burning, open detonation, and flashing. These methods have become out-of-favor due to environmental concerns (spread of uncontrolled or incomplete products of combustion into the air, soil, surface water, or groundwater), and health and safety risk to range personnel.

Before commercial release for recycling, DoD policy requires certification that the scrap metal is inert. Currently, certification that range scrap is inert is conducted by visual inspection, which is subjective and error-prone, due to the inability to inspect inside cracks, crevices, and internal parts. The uncertainties associated with certification by visual inspection present unacceptable risk to human health for field personnel removing scrap and commercial recyclers. The high costs for inspection and certification of firing range scrap offsets its recycle value. For these reasons, military activities increasingly find that they must address accumulations of range residue as a potential liability and invest assets in processing the materials.

A safe, environmentally-conscious alternative to decontaminate firing range scrap is a low temperature thermal desorption process called the HGD technology developed by the USAEC.
The HGD technology uses controlled heat to volatilize and thermally decompose the explosives contamination. A low-cost transportable HGD process configuration has been developed where the scrap metal is placed in piles and covered with an insulated thermal blanket. Propane-fired portable burners inject heat at a controlled rate to meet the time and temperature criteria (up to 600°F) to reach a decontamination level that can be certified as inert. The Transportable HGD system is a safe and effective method for decontamination of range scrap materials at the lowest possible cost, using commercially available equipment and materials.

The uncertainties (potential ineffectiveness) associated with certification by visual inspection present unacceptable risk to human health for inspectors, range personnel removing scrap, and to transporters and commercial recyclers. In the past several years, explosive incidents involving scrap metal from firing ranges have occurred during handling operations, resulting in death or serious injuries, forcing the DoD to review current scrap metal disposal practices.
2.0 Technology Description

2.1 TECHNOLOGY OVERVIEW

The HGD process uses low temperature heat (500 – 600°F) to volatilize and decompose explosives residues in contaminated range scrap metal. Hot burner gas directly contacts the contaminated materials to elevate its temperature. The effectiveness of the process is both time and temperature dependent. Holding times between 1 and 6 hours have been shown to be effective at the prescribed soak temperature. HGD is a transportable, low maintenance, and low operating cost system. Because of its temporary, on-site configuration, this is an inherently low-cost method to decontaminate range residue. On-site HGD technology is a lower-cost alternative to historical treatment methods, and results in less handling and transfer of explosive material and reduced safety risk to field personnel.

The transportable HGD system includes a skid-mounted burner system, a thermal blanket, a basic control system including thermocouple array and data acquisition system, and a fuel and power supply. A Process Schematic of the transportable HGD system for range scrap is shown in Figure 2.1-1. A propane air heater is used to heat the pile of range residue. To minimize heat losses and maintain heat in the scrap pile, a fire resistant thermal fabric and insulation is draped over equipment and pipe to contain the hot air. The thermal blanket is supported and held down by welded wire mesh to protect it from damage or displacement by wind.

![Process Schematic](image)

**Figure 1**
LOW COST HOT GAS DECONTAMINATION SYSTEM FOR FIRING RANGE SCRAP (NO OFF-GAS TREATMENT)

**Figure 2.1-1**
Process Schematic

Thermocouples with temperature transmitters are interlocked to the air heater fuel supply to control the programmed soak temperature of the scrap metal in the pile. The thermocouples are strategically placed at expected cooler locations (near the outside of the pile away from the burners). During heatup, the thermocouples indicate when their location has met the design criteria temperature (500°F), and the heat soak period can commence. When all of the thermocouples reach the soak temperature for the specified duration (3 hours), the decontamination process is complete.
The thermocouple signals are transmitted to a remote control station for recording and decision-making. Twelve thermocouples will typically be used for decontamination of the range scrap pile, to ensure that temperature-time criteria are met. A simple control process is employed for ease of operation and installation. Instrumentation is configured for remote read-out, with local read-out being used only for set-up and test.

The transportable HGD system is not dependent on fixed infrastructure, and relies on temporary fuel and power sources. Burner fuel is provided from temporary (leased) propane tanks. Electrical power is provided by a leased diesel generator and fuel tank.

2.2 PERFORMANCE CRITERIA

Results of the demonstration tests at Aberdeen Test Center indicate a temperature of 500°F for a 3-hour soak time are sufficient to effectively decontaminate range scrap contaminated with RDX, HMX, and TNT to below detectable amounts. Previous demonstrations of the HGD technology explored the temperature-time relationship necessary for achieving 5X-equivalent decontamination of explosives contaminated equipment and facilities. Results from tests at Hawthorne Army Depot indicate a temperature between 550°F and 600°F for a 6-hour soak was required. Test results from Alabama Army Ammunition Plant indicate the optimum operating conditions for achieving complete destruction of TNT, RDX, tetryl, and their breakdown constituents (i.e., to levels below method detection limits) were 600°F with a 1-hour soak.

The Hot Gas Decontamination technology has been proven effective in decontaminating explosives contamination for the following types of explosive materials:

- 2,4,6-Trinitrotoluene (TNT),
- Ammonium Picrate (Yellow D),
- Royal Demolition Explosives or Research Department Explosives (RDX),
- Composition A-3 (RDX and wax),
- Composition B (TNT, RDX, and wax),
- Tetryl,
- Smokeless Powder (Nitrocellulose/Nitroglycerin), and
- HBX (TNT, RDX, aluminum, lecithin, and wax).

2.3 SYSTEM DESIGN

An overview of the transportable HGD system design is presented in this section. For greater detail and for procurement purposes, refer to Appendix A for equipment specifications, Control System Block Diagram, and vendor list.

2.3.1 Burner System

The burner system is a skid-mounted assembly complete with combustion air fan, control panel, and burner shroud to direct the heat into the pile. The burner skid is set adjacent to the pile. Hot burner gas is directed into the pile through the shroud. The burner operates on propane gas with a maximum fuel usage of 1000 cu. ft./hr. The burner capacity is 2,500,000 BTU/Hr., with a turn down capability of 8:1 minimum. More detailed information on burner design and performance is presented in Specification Section 13200 in Appendix A. A photograph of the HGD system installed on a range scrap pile is presented in Figure 2.1-2.
2.3.2 Fuel and Electric Power
The transportable HGD system requires propane fuel and electric power. Propane to fire the burner should be provided from temporary propane tanks designed to deliver 1,000 cu.ft. per hour of propane at 20 psig. Technical specifications for the propane fuel system (tanks, gauges, regulators, and piping) are presented in Specification Section 13201 in Appendix A.

A diesel-fueled electric generator should be provided for electric power (240 Volts AC, 3-phase), either from the installation’s resources if available, or leased from local commercial vendors. Refer to Specifications Section 13202 in Appendix A for technical details on the generator, power cable, fuel system, and ground rod.

If reliable fixed line power (240 Volts AC, 3-phase) is available at the HGD site, then this a less expensive and less complicated alternative to generator power.

2.3.3 Control and Data Recording System
A local burner control panel (located on the burner skid) and a remote operator workstation (OW) are required as part of the transportable HGD system. The Burner Control System (BCS) includes primary measuring, indicating, transmitting, receiving, recording, totalizing, controlling, and alarming devices and appurtenances. The BCS is provided by the burner manufacturer as part of an integrated burner system. The major components of the BCS include:

- A hardwired burner flame safety system located on the burner skid. The flame safety controls and interlocks are as required by NFPA.
- A Programmable Logic Controller (PLC) located on the burner skid. The PLC provides burner firing rate controls and logic for the decontamination system as described below.

Figure 2.1-2
HGD System Installed on Range Scrap Pile
A personal computer based OW running an off-the-shelf process monitoring and control software package. The OW should be located remotely from the burner/pile (outside the radius of safety) and used to monitor parameters, adjust setpoints, and collect historical data.

Refer to Specification Section 13450 for technical details regarding the OW and PLC hardware, wireless communication system, and control system software. Refer to Specification Section 13460 for technical details of the local burner control panel located on the burner skid. The Control System Block Diagram is presented in Drawings I-01 and I-02 of Appendix A.

The OW communicates with the PLC using wireless spread spectrum radio modems. The OW shall be a standard Pentium III (or higher) personal computer operating on Microsoft Windows NT. The computer and software have the ability to generate reports, collect historical data, and provide trending information in the form of line graphs and bar graphs, for real time and historical data. Process control software packages to meet these requirements shall be either Genesis 32 (manufactured by Iconics), RSView 32 (manufactured by Rockwell Software), or Process Window (manufactured by Taylor Industrial Software).

The OW processes equipment graphics, continuous control and indication graphics, historical data trend graphics, and alarm logs in tabular format. The OW conveys the operational status of the process systems and equipment, and trends (on-line and historically) of all monitored and calculated signals.

The PLC and Input/Output (I/O) components are assembled in the burner control panel. PLC hardware, including processors, power supplies, rack assemblies, interconnecting cables, grounding system, modules, and accessories, are located in the burner control panel.

Monitoring of the temperature of the scrap pile uses a series of 12 thermocouples strategically placed within the pile to measure the temperature throughout the pile. The thermocouple temperature signals are input to a PLC and used for control functions. The thermocouples control the burner firing rate and maintain the scrap pile at the decontamination temperature criteria setpoint. The thermocouples indicate that all thermocouples are at or above decontamination temperature, when the minimum decontamination temperature is reached, and a timer will be initiated. The burner will be shut down when the timer indicates the pre-established decontamination period is completed for all thermocouples. An OW will be located in a shelter located outside the radius of safety (established by the installation safety branch). The OW communicates with the PLC using wireless modems.

2.3.4 Control System Logic/Sequence of Operations

Refer to Specifications Section 13415 for technical details of the Sequence of Operations and Control Logic. The logic and control functions are summarized as follows:

- (Up to 12) thermocouples should be strategically placed within the scrap pile to measure the temperature throughout the pile. The thermocouple temperature signals are input to the PLC and used for the control functions described below.

- The individual thermocouple temperature signals are displayed and recorded at the OW. A software selector switch is provided at the OW to allow the operator to choose which thermocouple temperature signals should be used by the control logic.
Location – The site should be in close proximity to the scrap storage area and should be located so the HGD process does not interfere with any other test, training, or OE removal activities.

Fire Prevention - The ground underneath each test pile and in the immediate vicinity of the test pile should be level and free of vegetation and debris. Vegetation and undergrowth shall be cut or removed within 100 feet of the test pile.

Safety - The site should be large enough to accommodate the required safety zone between the scrap piles and personnel. The safety zone is an installation-specific distance between the pile and personnel stations (when the burner is operating). At active or closed firing or target ranges, the ground beneath a HGD system must be surveyed and cleared to a depth of 2 feet as free from UXO. A geophysical survey shall be conducted for UXO lying underneath prior to construction of the range residue pile. Any UXO detected will be removed by qualified personnel or that particular location will be avoided.

Security – The scrap processing site should ideally be fenced, for personnel safety and to ensure that unacceptable items are not mixed into the target scrap after initial inspection. Treated scrap should be placed in a lockable container to ensure that live rounds or other unacceptable items are not inadvertently co-mingled after treatment.

Infrastructure – The transportable HGD process is designed to be self-contained with portable utilities (propane tank and electric generator), and fixed infrastructure (utilities) is not a requirement for a potential site.

3.2 INSTALLATION AND SETUP

3.2.1 Pile Construction
The pile size of 18-foot diameter with an 8-foot height in the center (in a semi-sphere shape) is the maximum for the burner system as currently sized. Refer to the Standing Operating Procedure (SOP) for HGD system installation and setup in Appendix B.

Prohibited Items
The range residue pile should be free of trash, paper, cardboard, and wood products, and limited to range residue (shrapnel and range target scrap metal). There are certain other materials that are not appropriate for thermal treatment by HGD, or where additional safety or environmental controls must be implemented prior to application of the HGD process. This is the case when the application of heat at temperatures may cause undue safety or environmental risk. There are specific materials that are not appropriate for HGD technology. Prohibitions, justification, and mitigating measures are discussed as follows:

- No live rounds: If a substantial amount of explosive material is confined in a shell or other confined location, the explosive has a potential to detonate when heated under confinement. No live rounds should be placed in the range pile to be decontaminated. A first screen of range residue must be undertaken to ensure that no live rounds are placed in the pile. As would be expected, live rounds will detonate when subjected to heat, and the HGD system is not designed to withstand a detonation without damage to the system. Equipment containing high levels of residual explosives presents an explosive hazard and requires special consideration. If such a situation is encountered at a site being decontaminated, the equipment and confined explosive material must be cut out and removed before application of HGD process. Note that threaded pipe and joints in this situation should be cut out and not unthreaded, due to explosive hazard.
• No concrete-filled rounds should be placed in the range pile. A dummy round filled with concrete, when heated above 212°F, will be subject to a steam explosion (from the water of hydration release from the concrete), unless it is opened up to relieve the steam pressure. Consequently, concrete-filled rounds must be (very carefully) opened without using heat generating cutting or torching methods, prior to HGD. Water jet cutting and open detonation with small explosive charges are two methods for opening concrete-filled rounds.

• No PCB or lead based paint: Hot Gas Decontamination is not appropriate for scrap metal with paint containing PCBs or lead. The PCB or lead in paint will volatilize when exposed to elevated temperatures. In this instance, PCB or lead-containing paint should be removed in accordance with applicable state and federal regulations.

• No galvanized sheet metal: When heated above 700°F, galvanized steel releases toxic vapor emissions. To use HGD in this case, the galvanized metal must be insulated from the hot burner gas or the temperature of the hot burner gas restricted to well below 700°F.

• Electrical wiring, electrical motors, and wood are not appropriate materials for HGD due to combustibility of the materials. These must be removed prior to initiating HGD.

• No automotive fluids, batteries, tires, and fuel tanks should not be treated by HGD and should be removed from target vehicles.

3.2.2 Insulation and Thermal Fabric

The range residue pile shall be insulated with standard high temperature industrial insulation and high temperature thermal fabric. Refer to the Specification Section 15250 of Appendix A for technical information about the high temperature insulation and fabric. The order of placement of materials is as shown in Figure 3.2-1 as described as follows:

Bottom layer: Stainless Steel Welded Wire Mesh – Welded wire mesh will be used to support the insulation and prevent damage from sharp objects in the pile during installation. Stainless steel wire mesh shall be used in the vicinity of the burner (over one-half of the pile closest to the burner), and carbon steel wire mesh can be used away from the burner (over the far half of the pile). Galvanized steel wire mesh shall not be used under the insulation.

Second layer: Welding blanket - High temperature thermal fabric will be used in the immediate vicinity of the burner to seal the burner exhaust flange to the pile and protect the insulation from exceeding manufacturer's recommended maximum temperatures. This material will be used over an estimated one-third of the pile.

Third layer: Thermal insulation - The insulation layer will be placed to conform to the pile shape. High temperature silica-based insulation shall be used to cover the front half of the pile and high temperature fiberglass insulation shall be used to cover the back half of the pile. Care should be taken not to damage the insulation during installation or removal. The insulation should be preserved for reuse on subsequent piles. Insulation should be stockpiled under tarpaulins when not in use for weather protection. A minimum of 1 inch of insulation thickness
is required, and more than one inch is desirable since it will decrease operation time. One and half or two inches of insulation will substantially decrease time to decontaminate (and cost if operation is attended full time). The effect of heat loss through seams is overcome by installing with staggered layers of insulation (overlapping seams) will be explored in later tests. Multiple layers of insulation may be used to achieve greater thickness, in which case the insulation layers will be staggered such that seams overlap.

Top layer (Thin gauge welded wire mesh) - Wire mesh shall be used to hold the insulation layer in place to prevent displacement due to wind and weather. The wire mesh shall be pinned to the ground to secure the insulating system in place.

The following is a list of manufacturer’s high temperature limits for insulation materials which should not be exceeded:

- Ametek Sil Temp silica-based fabric - 1800 °F
- Ametek Sil Mat silica-based insulation - 2000 °F
- BGF Mat fiberglass insulation - 1200 °F

**Personal Protective Equipment (PPE) for Installation and Removal of Insulation**

Depending on the specific type of insulation material used, PPE must be worn by personnel installing or removing insulation, in accordance with the Material Safety Data Sheet (MSDS) for the manufacturer’s insulation product (as interpreted by the post’s Safety group or Industrial Hygienist). The insulation has a tendency to throw off fibrous dust when it is moved (although the dust is not known to be below inhalation levels of 3 microns). The level and type of PPE depends on whether the insulation is silica-based, fiberglass, or other material. Depending on the above factors, appropriate PPE may include Tyvex suits, gloves, safety glasses, dust masks, or full-face respirators.
For silica-based insulation, MSDS (Appendix C) indicate that inhalation of fibers may cause irritation to the mouth, nose, and throat. Fibers and dust may cause temporary irritation to the eyes. Direct contact with the skin may cause temporary irritation to the skin. In addition, silica-based insulation that has been subjected to elevated temperatures (>1800°F) may undergo partial conversion to cristobalite, a form of crystalline silica, which may cause respiratory illness. The amount of cristobalite present will depend on the temperature and length of service. The OSHA permissible exposure limit (PEL) for cristobalite is 0.05 mg/m³. Particular care should be taken when working with used silica-based insulation (after HGD) to minimize dust. Dust control measures (spray on fixatives or water) are appropriate for used insulation. If exposure limits are exceeded or irritation is experienced, approved respiratory protection is necessary.

3.2.3 Thermocouples
Thermocouples (approximately 12) should be strategically located within the scrap pile approximately as shown in Figure 3.2-2 to measure temperature and the effectiveness of the burner to heat the pile to the desired temperature. The thermocouples are used to monitor temperature at various locations in the pile and monitor progress of each decontamination run. The thermocouples have two primary purposes as follows:

- At the outer reaches of the pile, the thermocouple data provides proof that the decontamination criteria (time and temperature) have been met.
- At locations in the vicinity of the burner, the thermocouple signals indicate that the temperature limitations of the insulation are being approached and the heat should be cut back to protect the insulation blanket.

K-type thermocouples with Q-fibre leads with stainless steel overbraids should be used. Extra care should be taken not to expose the thermocouple leads to extreme heat, by placing the thermocouple through tiny penetrations cut into the insulation blanket, thereby protecting the leads. Technical details for the thermocouples are presented in Specification Section 13200.

A majority of the thermocouples should be located in projected cold spots in the pile, in high and low locations on the far side from the burner near the outside of the pile. These eight thermocouples and lead wires will be carefully placed near the outside of the pile (within an inch or two of the insulation) to protect the thermocouple lead wires.

Temperature profile data is collected by the OW. Operations personnel shall produce a sketch of thermocouple locations within the pile. The sketch will reference thermocouples by tag number and show their location. It is important that the correct thermocouple then be connected to the appropriate control system input. Using the sketch and thermocouple tag number, the temperature profile within the pile can be accurately tracked.

Thermocouple wires shall exit the pile such that they can be routed to the burner control panel. Thermocouple wire will not be placed under or through the pile (except in metal conduit as described for the center thermocouple).

3.2.4 Burner Skid Assembly
The burner skid assembly can be picked up and moved to the pile by forklift. High temperature thermal fabric should be draped around the burner shroud and onto the scrap pile to provide a seal around the burner interface with the scrap pile.
Figure 3.2-2
Thermocouple Placement in Pile
3.2.5 Fuel Supply
Two temporary propane storage tanks shall be located approximately 100 feet from the pile (and burner). Armor shielding for this equipment may be required at the discretion of the installation safety office. This decision is mostly dependant on the possibility for live munitions to be mistakenly mixed into the pile scrap. Propane from the tanks shall be supplied to the burner in a temporary configuration using aboveground flexible hose.

The propane fuel tanks are sized to satisfy the delivery rate of 1000 cu.ft./hr. for up to 24-hours of operation. The propane tanks should be provided with a fuel gauge, regulators, manifold piping, and piping between tanks and burners.

3.2.6 Electric Power
Electric power is required for the combustion air fan and burner control system on the burner skid and the remote OW. The transportable HGD system is configured with a leased temporary electric power source, for deployment at remote locations. Of course, at installations where line power is readily available and convenient, line power is more economical and preferable.

A diesel-powered electrical-generator set with fuel tank should be located approximately 100 feet from the pile and burner skid. The electric generator will provide electric power to the burner skid and OW using temporary aboveground power cable. The generator can be trailer or skid mounted, and include integral diesel fuel tank. A ground rod should be driven into the ground in the vicinity of the generator and connected to the generator.

3.2.7 Operator Workstation
The OW should be housed in a temporary shelter at or outside the perimeter of the radius of safety. The shelter should be provided with power (120 VAC), and heating and cooling to accommodate the OW and operator. The HGD system will be operated from the OW after the burner is turned on.

The maximum distance from burner skid to the remote OW is 1800 feet. The minimum distance from burner skid to the remote OW is established by the installation’s Safety Office. At Aberdeen Test Center, the installation established a safety distance of 1250 feet, which was in consideration of the possibility of live rounds in the scrap pile. The OW communicates with the PLC using wireless modems.

3.2.8 Installation Labor Requirements
Labor requirements for initial setup and installation of the HGD system and insulation system on one pile are as follows:

- One pipe fitter/mechanical technician and one helper for one day.
- One electrician/instrument technician and one helper for one day.
- Forklift operator for one-half day.

Labor requirements for moving the HGD system and insulation system to another pile at a nearby location are as follows:

- Forklift operator for one-half day.
- Two laborers for one day.
3.5 OPERATION

3.5.1 Burner Startup and Operation
Refer to the manufacturer’s Operation and Maintenance Manual for procedures for startup and operation of the burner system.

3.5.2 Processing Schedule
The HGD process for range scrap in range pile configuration will be operated in a batch mode. The effectiveness of the process is both time and temperature dependent, which are the two primary operating parameters to decontaminate the explosives-contaminated range scrap.

Using a time-temperature criteria of 500 °F for 3 hours as proven effective in this demonstration, a processing time of 7 to 12 hours can be achieved (depending on pile size, scrap density and amount of water, weather, and other operating parameters. Operations costs are the primary motivation to reduce the overall operating time for the system; with the objective of minimizing or eliminating premium overtime. The overall time to operate the burner includes the heatup time plus heat soak time, but not including cooldown time. Physical parameters that affect the time to operate the system include the pile size, the thickness of insulation applied over the pile, and the heat input from the burner as follows:

- A smaller pile requires less time to heat up and soak at temperature than a larger pile.
- A thicker insulation layer (or multiple layers) will hold heat resulting in shorter heat up times.
- The heat input is a characteristic of the burner size, turn down ratio, and control and operation. The burner size and turn down ratio have been designed and specified for the system at 2.5 million BTU/hr. and 8:1 turndown respectively.

The sequence of pile construction and operation is described as follows. Allow one week for initial set up of the transportable HGD system and utilities for the first time. After initial system setup, the expected sequence of construction of piles and equipment, and operation as follows:

- Day 1 – Setup decontamination system at pre-existing scrap Pile 1.
- Day 2 – Operate decontamination system at scrap Pile 1. Place insulation blanket and thermocouple on new pile if safe distance from Pile 1.
- Day 3 - Cooldown scrap Pile 1; relocate burner skid to Pile 2.
- Day 4 - Cooldown scrap Pile 2; relocate burner skid to Pile 3.
- Repeat.

To minimize labor costs, one operations objective is to complete operation of the decontamination system for individual piles in one day, and preferably in one shift.

Sufficient time should be allowed for cooldown of the pile between completion of operations and removal of the HGD equipment and insulation blanket assembly. Cooldown of the pile is required before removing the burner assembly for use at another pile. A spare set of thermocouples should be available to allow extra time for cooldown before retrieving thermocouples and leads for reuse. Sufficient thermal blanket and wire mesh should be available for two piles for the same purpose. Construction of subsequent piles, and movement and installation of equipment is expected to take one day. The construction of subsequent pile can
overlap the cooldown of the prior pile. Burner removal from the old pile and re-placement at the
new pile should occur on the day following operation. Work can be organized such that
cooldown of the pile will occur over the weekend, when convenient.

3.5.3 Processing Rate
The quantity of range scrap to be treated depends on the exact size of the scrap pile. The design
basis pile size for the burn system is a semi-spherical shape, 8 feet high by 18 feet in diameter.
The volume of the pile at this design size is approximately 3,000 cu.ft. The density of the scrap
metal varies with the size of the fragments and type of metal (i.e., steel, aluminum, or others).
The scrap metal generated by the Army is mostly steel, and the measured density of range scrap
generated at Aberdeen Proving Ground is 53 lbs. per cu.ft., from data from previous scrap
shipments. As a result, the quantity of scrap to be treated in each pile is 8 tons of range scrap.
At a projected treatment rate of 1 pile per day, the amount of scrap to be treated is estimated to
be 8 tons per day (not including pile construction and equipment setup). During full scale
production, a treatment rate of 4 tons per work day of range scrap can be expected, based on one
day for setup and one day for operation.

3.5.4 Treated Scrap Removal
Sufficient time should be allowed for cooldown of the pile prior to removal of the scrap metal.
Decontaminated scrap metal should be handled, treated, or prepared for offsite disposal in
accordance with range residue and solid waste protocols. If the items are recyclable scrap metal,
they should be handled in accordance with DoD 4160.21 –M, Defense Materiel Disposition
Manual, Department of Defense Office of the Deputy Secretary of Defense (logistics). In
summary, the Defense Materiel Disposition Manual states that the range residue will be
inspected (if required), appropriate signatures will be acquired for rendered safe certification,
radiation clearance certification, inert certification, demilitarization (DEMIL) certification, and
will be sorted and secured for final sales through the Defense Reutilization and Marketing Office
(DRMO). It is expected that the scrap metal from the test piles will be recycled by commercial
scrap dealers.

3.5.5 Operation Labor Requirements
Labor requirements for operation of the HGD system are:

- One operator and one assistant for one day.

The determination of whether the HGD system for range scrap can be operated as an unattended
operation depends on fire safety and explosive safety considerations, which are site specific as
dictated by the installation’s fire protection branch.

For attended operations where labor expense mount up during operation, heat up time is a major
cost driver for the HGD system. If the system must operate more than an 8 or 10 hours a day,
labor cost will be substantially higher. Technology-related cost drivers which affect heat up time
include the burner size, pile size, insulating blanket material type, and thickness. Each of these
items has a direct effect on the time needed to heat the pile to the prescribed soak temperature.

3.5.6 Factors Affecting Operating Cost
Whether the system is operated as an attended operation or an unattended operation is a major
contributor to cost. Cost drivers that are not technology related include fuel costs for the
electrical generator and propane for the burner, and labor cost for installing and operating the
HGD system. Weather factors (time of year, cold, wind, snow, rain) and weather delays are
another issue that will affect heat up time and cost. The local availability of rental equipment (vs. purchased equipment) affects capital cost of equipment and overall life cycle costs.

Size and type of range scrap material is another cost driver. Range residue is not homogenous and may consist of targets, and large, medium and small items, which affects the heat transfer characteristics of the pile, and consequently the heat up time.

A significant cost to the HGD process is the cost of the thermal blanket and insulation. The durability of insulating blankets and ability to reuse blankets multiple times is another cost driver. The thermal blanket and insulation should be reused as many times as practicable to reduce the cost per ton. Care should be taken not to tear or damage the insulation when installing or removing it from the pile.

3.6 DEMOBILIZATION
Upon completion of operations on the pile of range residue, the HGD system will be decommissioned and demobilized. As a temporary and transportable system, the HGD system and ancillary equipment will be readily disassembled and demobilized.

Care should be taken to dismantle, disassemble, package, and relocate equipment without damage, with the intention of reusing equipment in the short or long term. Equipment, such as the skid mounted burner assembly and the OWS, will be removed as whole assemblies rather than as individual components, in anticipation of future reuse. Electronic equipment, such as the OW, will be stored indoors in a climate-controlled environment while awaiting its next assignment.

Special care and PPE will be used when removing insulation blanket according to the manufacturer’s MSDS. Insulation blanket that is still serviceable, will be packaged in weather-proof material and stored. Insulation blanket that is no longer reusable, will be disposed of in accordance with manufacturer’s MSDS and installation disposal requirements.

4.0 Safety, Environmental, and Security Considerations

4.1 SAFETY CONSIDERATIONS
Decontamination of range scrap must be undertaken in a safe, responsible and environmentally acceptable manner. Worker health and safety is a primary project criteria. Local fire codes and site safety requirements must be reviewed and complied with. For example, temporary fuel storage tanks (propane or other fuel) and other hazardous materials must comply with codes and regulatory requirements, including separation distances. A project-specific Health and Safety Plan (see Appendix D) is required to address the installation and operation of the HGD process for each facility. The current or past uses of adjacent facilities should be considered when identifying the project-specific safety requirements.

Installation of the insulation or the thermal blanket should not be undertaken during heavy precipitation (rain or snow), since the insulation will be wet and heavy, and possibly can be damaged when manipulated in this condition. Although the insulation will shed water and dry out, it is not advisable to risk damage to the material.

The range residue pile will be constructed so as to minimize potential for explosion and fire, due to combustion of combustible materials exposed to the heat of the process. Fire extinguishers
shall be provided in the immediate vicinity of the operation. The installation Fire Protection Branch shall be briefed on the nature and hazards of operation of the HGD system.

If work is conducted on an active or inactive test or training range, a geophysical survey shall be conducted at the site of each range pile for UXO lying underneath the work area. Any UXO detected will be removed by qualified personnel or that particular site will be avoided. There is no digging or intrusive activities associated with the HGD operation. At the location of the electric power generator, a geophysical survey for UXO should be conducted for placement of the ground rod.

Range residue must be inspected and certified free from live munitions and quantities of explosive materials that create danger of detonation.

A radius of safety must be established where operations and installation personnel are prohibited from entering during system operation. Due to uncertainties with regard to explosive hazards during the test, a conservative radius of safety must be established by the installation safety group depending on the size and type of munitions shells in the range scrap. Operators are not permitted to enter the radius of safety while the burner is operating. The HGD system is designed to operate remotely from outside the radius of safety. The radius of safety established for the demonstration test at Aberdeen Test Center was 1250 feet, based on a 105 mm round.

For fire safety, the installation Fire Protection Branch should make the determination on how much area should be cleared around a pile. In areas where there is little or no vegetation, the HGD may be operated unattended if allowed by the installation Fire Protection Branch. In some installations, the HGD system may be operated unattended with the approval of the installation Safety and Fire Prevention groups (for example in a desert area with no vegetation or fire hazard). The HGD system is fully automated with safety shutoff systems to have the capability to operate unattended. Otherwise, the system should be attended full time when operating, and for at least one hour during cooldown after the burner has been shut down.

Extra care will be exercised by workers when handling (sharp) scrap metal when constructing the pile. Work gloves, steel toed boots, and long pants and long sleeve shirt will be required. Special care should be exercised when and if reaching into the pile is necessary to place or move coupons, thermocouples or thermocouple wires.

A direct line of sight from outside the radius of safety to the pile must be maintained, including one direct line of site to burner assembly, and fuel/generator site. One of the vantage points should be from the OW if practicable. However, line of sight from the OW is not an absolute requirement.

Non-participating installation personnel will be kept outside the radius of safety through the use of warning signs and announcements at installation safety briefings.

4.2 SECURITY CONSIDERATIONS

The range residue piles should be secured within a fenced area due to the potential explosive hazard in the pile, and the potential for co-mingling of explosive hazard materials (live rounds) with previously treated or certified materials. Security of the pile will be effective immediately at initiation of the pile construction with certified munitions-free scrap, to ensure that no uncontrolled, uncertified scrap is inadvertently placed in the pile. Temporary fencing and warning signs may be used for this purpose.
Range residue will be controlled and secured from the time it is certified as free from live munitions, until it is shipped off the installation to the appropriate receiving organization. Range residue that has been decontaminated will be loaded into lockable containers, and locked and tagged.

4.3 ENVIRONMENTAL CONSIDERATIONS
Installation environmental personnel must determine the need for and obtain permits or other site specific environmental documentation. Since this system is mobile, transportable and not a point source, it is more readily permitted than a permanent processing system or structure.

Environmental permitting requirements, emissions limitations, and monitoring requirements must be determined on a case-by-case basis. Use of emissions estimates, air modeling and fate and transport models may be used to make a case for HGD with no off-gas treatment. Operational controls (such as wind speed and direction restrictions) can be placed on the system to further promote the HGD system without off-gas treatment concept. For example, in a remote location with a reasonable regulatory oversight and no nearby receptors, a HGD system with no off-gas treatment may be judged acceptable as a quick, low-cost method to remove a scrap problem. The system was operated at Aberdeen Test Center under an open burn permit.

Generally speaking, the off-gas treatment system is very expensive and drives the overall system cost up. The off-gas treatment system typically can be 25 to 40 percent of the overall system cost. As a one time decontamination action, off-gas treatment is not an absolute requirement by regulators at all locations. The system was operated without off-gas treatment in Maryland under an open burn permit with ambient air monitoring. The requirement for an off-gas treatment system must be evaluated on a case-by-case basis considering the site location and distance away from populated areas and off-site receptors, and local and state regulatory standards.

There are no expected hazardous materials or wastes that will result from the HGD operations or demobilization. There are no expected air emissions or wastewater associated with demobilization.
5.0 Points of Contact

The contact information for key personnel is as follows:

<table>
<thead>
<tr>
<th>Point of Contact</th>
<th>Organization</th>
<th>Phone/Fax/Email</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Deborah Furnari</td>
<td>US Army Aberdeen Test Center 400 Colleran Rd. Aberdeen Proving Ground MD 21005-5059</td>
<td>Phone: 410-278-7451 Fax: 410-278-9353 Email: <a href="mailto:dfurnari@atc.army.mil">dfurnari@atc.army.mil</a></td>
<td>Test Site Manager</td>
</tr>
<tr>
<td>Mr. William Kelso, PE</td>
<td>Parsons Corporation 1700 Broadway #900 Denver CO 80290</td>
<td>Phone: 303-831-8100 Fax: 303-831-8208 Email: <a href="mailto:william.kelso@parsons.com">william.kelso@parsons.com</a></td>
<td>Engineering Manager</td>
</tr>
</tbody>
</table>

6.0 References


APPENDIX A

EQUIPMENT AND MATERIALS SPECIFICATIONS, DRAWINGS, AND VENDOR LIST
APPENDIX A

EQUIPMENT AND MATERIALS SPECIFICATIONS, DRAWINGS, AND VENDOR LIST

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<td>Section 13201</td>
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<td>Section 13202</td>
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<td>Section 13415</td>
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<th>Drawings</th>
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<tr>
<td>Drawing I-01</td>
</tr>
<tr>
<td>Drawing I-02</td>
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A-1
# TRANSPORTABLE HOT GAS DECONTAMINATION SYSTEM

## EQUIPMENT AND MATERIALS LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Skid-mounted Burner Assembly with Control System and Thermocouples</td>
<td>See specification and vendor list</td>
<td>1</td>
</tr>
<tr>
<td>Computer with Remote Wireless Modem</td>
<td>Pentium III or higher</td>
<td>1</td>
</tr>
<tr>
<td>High Temperature Insulation</td>
<td>High temperature flexible batt in rolls. 1. Silica-based for front half of pile 2. Fiberglass for back half of pile</td>
<td>1. 350 sq. ft. for front half of 18’ Dia. x 8’ high pile 2. 350 sq. ft. for back half of 18’ Dia. x 8’ high pile</td>
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<tr>
<td>High Temperature Thermal Fabric</td>
<td>Silica-based welding blanket</td>
<td>350 sq. ft. for front half of pile</td>
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<tr>
<td>Stainless steel welded wire mesh</td>
<td>T304 Stainless 2 Mesh (1/2”x1/2”) 0.047” or 0.063” dia. (underlay insulation)</td>
<td>700 sq. ft. (2 rolls at 4” x 100”) for 1 pile</td>
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<tr>
<td>Thin gauge wire mesh</td>
<td>Galv.Steel Reverse Twist Hex Mesh 0.035”dia (Chicken wire; overlay insulation)</td>
<td>700 sq. ft. (2 rolls at 4” x 150”) for 1 pile</td>
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<tr>
<td>Landscape Nails</td>
<td>6” to 9” steel nails</td>
<td>25 per pile</td>
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# TRANSPORTABLE HOT GAS DECONTAMINATION SYSTEM

## VENDOR LIST

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<th>Item Description</th>
<th>Model Number</th>
<th>Size/Available Quantities</th>
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<td><strong>Burner Assembly</strong></td>
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<tr>
<td>Hauck Manufacturing</td>
<td>Skid mounted</td>
<td></td>
<td>2,500,000 BTU/hr.</td>
</tr>
<tr>
<td>P.O. Box 237</td>
<td>burner assembly</td>
<td></td>
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</tr>
<tr>
<td>Nazareth, PA 18064</td>
<td>with controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>610-759-7110</td>
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<tr>
<th><strong>High Temperature Insulation and Thermal Fabric</strong></th>
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<tr>
<td>Ametek Haveg Division</td>
<td>1. SILTEMP High</td>
<td>1. 84 CSR (Abrasion</td>
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<tr>
<td>900 Greenbank Rd.</td>
<td>Temperature Silica</td>
<td>Resistant)</td>
<td></td>
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<tr>
<td>Wilmington DE 19808</td>
<td>Fabrics</td>
<td>2. AB100S (Pre-</td>
<td></td>
</tr>
<tr>
<td>1-800-441-7777</td>
<td>2. SILMAT Needled</td>
<td>shrunk) or AB50S</td>
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<tr>
<td></td>
<td>Insulation</td>
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<tr>
<td></td>
<td></td>
<td>thick; 3' X 150'</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>rolls</td>
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<td>2. 1 inch thick-</td>
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<tr>
<td></td>
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<td>3' x 25' rolls or</td>
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<td>½ inch thick,</td>
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<tr>
<td>BGF Industries</td>
<td>Fiberglass</td>
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<td>3802 Robert Porcher Way</td>
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<td>Greensboro NC 27410</td>
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<td>1. Stainless</td>
<td>1. T304 Stainless</td>
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<td>121 Harding Av</td>
<td>Welded Wire</td>
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<td>Bellmawr NJ 08031</td>
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<tr>
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<td>2. hex mesh</td>
<td>2. Galv.Steel Reverse</td>
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<td>(Chicken wire)</td>
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<td></td>
<td>0.035&quot; dia</td>
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<tr>
<td></td>
<td></td>
<td>1. 4' W x 100' L</td>
<td></td>
</tr>
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<td></td>
<td>2. 4' W x 150' L</td>
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<td>Gerard Daniel</td>
<td>1. Stainless</td>
<td>1. T304 Stainless</td>
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<td>V</td>
<td>Valve</td>
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<tr>
<td>G</td>
<td>Gate Valve</td>
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<tr>
<td>K</td>
<td>Knife Valve</td>
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<td>L</td>
<td>Plug Valve</td>
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<td>Ball Valve</td>
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<td>Diaphragm Valve</td>
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### PROCESS SYMBOLS

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### MISCELLANEOUS MECHANICAL ITEMS

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### LINE CODES

- **NEW PROCESS LINE** or **MECHANICAL CONNECTION**
  - **FLEXIBLE HOSE**
- **SIGNAL LINE** (electrical, discrete, or analog)
  - **NOT USED**
- **HYDRAULIC LINE**
  - **HEAT TRACING**
- **CAPILLARY**
  - **FLEXIBLE TUBING**
- **SOFTWARE SIGNAL LINE**
  - **DATA HIGHWAY OR FIELDbus SIGNAL**

### FUNCTION IDENTIFIERS

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### NOTES

1. **V** indicates a high-pressure valve.
2. **G** indicates a gate valve.
3. **K** indicates a knife valve.
4. **L** indicates a plug valve.
5. **B** indicates a ball valve.
6. **D** indicates a diaphragm valve.
7. **A** indicates an angle valve.
8. **C** indicates a control valve.
9. **P** indicates a pressure valve.
10. **R** indicates a relief valve.
11. **N** indicates a needle valve.
12. **X** indicates an X-Valve.
13. **Y** indicates a Y-Valve.
14. **Z** indicates a Z-Valve.

### DEVICE TAG NUMBERING SYSTEM

**TYPICAL TAG:** AAA-BBBB-CDDD-EF

**WHERE:**
- **AAA** = BUILDING IDENTIFIER (NOT USED)
- **BBBB** = FUNCTION IDENTIFIER (FROM ABOVE TABLE)
- **DDD** = UNIT PROCESS IDENTIFIER (1-99)
- **EEE** = LOCATION NUMBER (1-99)
- **FFF** = SERIES NUMBER (1-9)
- **G** = SUBSET, if required (A-Z)

**UNIT PROCESSES:**
- GOOD Combustion Air Blower
- GOOD Fueledoven
- GOOD PUE Related
SECTION 13200
BURNER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Equipment and accessories required for a complete burner system, that satisfies all applicable state and federal codes. Burner system shall include the following:
1. Skid mounted pre-piped and pre-wired burner system.
2. Skid mounted burner flame safety system.
3. Skid mounted, PLC based, Burner Control System (BCS).
4. Remote personal computer based operator workstation (OW).
5. Combustion air system for burner.
6. Gas control system for burner.
7. Thermocouples.
8. Ancillary components necessary for a complete, self-contained, and fully functional system.

B. Related Sections:
1. Section 13415 - Sequence of Operation.
2. Section 13450 - Control Computers And Programmable Logic Controllers.
3. Section 13460 - Unit Control Panels.

1.2 SYSTEM DESCRIPTION

A. Burner fuel:
1. Burner shall operate on propane.
2. Propane shall be delivered to burner at 20 PSIG (gas).
3. Maximum burner fuel usage: 1000 CU FT/HR.
4. Propane will be provided by Owner.

B. Burner capacity: 2,500,000 BTU/HR.

C. Burner turn down capability: 8:1 minimum.

D. System location: Outdoors, Aberdeen, Maryland.

E. Electrical Power:
1. Provided by diesel fueled generator.
2. Generator provided by Owner.
F. Maximum distance from skid to remote OW: 1800-feet.

1.3 PERFORMANCE REQUIREMENTS:

A. The burner and all related components (except OW) shall be skid mounted, fabricated and tested at the factory, and delivered as a single component.

B. The OW shall be provided preprogrammed, tested, and ready for use at the site.

C. Unless otherwise specified, equipment furnished under this section shall be fabricated and installed in compliance with the instructions of the manufacturer.

D. Ensure that all equipment, accessories and installation materials comply with the specification and that adequate provision is made in the design and fabrication for mounting the specified system equipment and accessories.

E. Provide an BCS complete in every detail to perform the intended control functions as shown on the Drawings and described in the specifications, including:
   1. Labor, materials, equipment, and performance of all Work necessary to manufacture, assemble, program, calibrate, test, start-up, and demonstrate a complete and operable BCS.
   2. The BCS is shown on the Drawings and specified in the level of detail necessary to convey to the burner manufacturer the intended functions.
   3. The burner manufacturer shall thoroughly design the BCS to the detailed level necessary to obtain approval through submittals and shall then manufacture, assemble, install, test, start-up, and demonstrate a complete and operable system.
   4. The BCS as specified shall be a complete, thoroughly designed, and integrated system.
   5. The components of the BCS, including primary measuring, indicating, transmitting, receiving, recording, totalizing, controlling, and alarming devices and appurtenances, shall be completely compatible and shall function as required.
   6. Provide any such additional equipment and accessories as required to meet the intended requirements of the BCS at no cost to Owner.
   7. The BCS and all related items of equipment, as described in related sections of Division 13, shall be provided by the burner manufacturer.

F. Provide all labor, equipment and material required to provide a complete and functional system.

1.4 SUBMITTALS

A. Shop Drawings.
   1. Installation drawings.
2. Electrical interconnection diagrams.

B. Manufacturer's Product Data.
1. Provide complete legible manufacturer’s product data for each item of equipment.
2. Clearly identify options being provided.
3. Neatly strike out options not being provided.

C. O&M Manuals:
1. Shall include the following minimum information in addition to that normally provided or required by the manufacturer.
a. Table of contents.
b. Name, address, and telephone number for burner manufacturer.
c. Description of each item of equipment and system addressed in O&M Manual. Use project specific equipment tag numbers and names.
d. Product Data as follows:
   1) For each item or product provided.
   2) Identifying only provided options and accessories.
   3) Listing complete model number as needed to order an exact duplicate.
e. General drawings as follows:
   1) Showing all parts, assemblies, and sub-assemblies.
   2) With bill of materials.
   3) Showing arrangement and inter-relationship of all parts and equipment.
   4) Showing controls, direction of flows, and as-built installation.
f. Electrical drawings as follows:
   1) Showing all control devices and prefabricated wiring and conduit.
   2) Complete and accurate control schematics.
   3) Control panel layouts with bill of materials.
   4) Identifying all termination’s and terminal strips.
g. Equipment or systems provided with electronic controls, include:
   1) Electronic versions of as-built control logic.
   2) Users, Programmers, and other types of manuals for devices, components, and programming equipment.
   3) Listings of all configuration parameters.
   4) Listing of all setpoints.
   5) Settings for all configuration dip switches.
   6) Programming software on electronic media compatible with Owner’s computer hardware.

h. List of recommended spare parts.
i. List of recommended and alternate consumables and expendables such as lubricants and filters.
j. Nameplate data for each item of equipment.
k. Identify each different source of power. Use nomenclature specific to project.
l. Listing of setpoints for all adjustable devices.
m. List and rating of all fuses or breakers.
n. Clear and concise written instructions, with illustrations as required, for the following:
   1) Normal operational procedures.
   2) Normal routine maintenance, including recommended intervals.
   3) Long term storage procedures.
   4) Start-up and shut-down procedures.
   5) Adjusting and trouble shooting procedures.
   6) Programming procedures.
   7) Emergency and safety procedures.
o. Copies of all information provided as part of the approved Product Data or Shop Drawing submittals.
p. List of alarm and setpoints when equipment is controlled by external control system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Price shall include shipment of components to site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide systems as manufactured and integrated by:
   1. Hauck Manufacturing Company, contact:
      Joe Vasco
      P.O. Box 237
      Nazareth, PA 18064
      Phone: 610-759-7110
   2. Or equal.

2.2 GENERAL - OVERALL CONFIGURATION

A. The intent of the Specifications and Drawings is to obtain a packaged and integrated burner system with all necessary and required process and flame safety controls and accessories.

B. The burner system and components shall be mobile such that they can be moved to different sites, set up, and put into service with the least amount of effort. The accomplish this, the burner system shall provide equipment and components assembled as follows:
1. Skid mounted assembly. Suitable for loading and unloading with a fork truck and transporting by fork truck or flat bed truck.

C. Electrical power:
1. Power for all equipment will be provided by a mobile generator (generator provided by Owner).
2. The generator will provide a single service (up to 70 amps at 240 VAC, 3-phase).
3. Provide a main circuit breaker sized for skid electrical loads.
4. Power will be provided via #4 cables. Provide lugs to accommodate same.
5. Provide power to all skid mounted equipment from this single source.
6. Provide control voltage and other transformers and power distribution equipment as required.

D. Communications:
1. The control system design, as defined in the Specifications and shown on the Drawings, requires the following: Communications between the burner skid and the OW over a wireless communications networks.

E. In general, the skid mounted equipment shall include:
1. Burner.
2. Burner flange: to allow burner to be connected to insulating blankets covering pile.
3. Combustion air blower, train, and controls.
4. Gas fuel train and controls.
5. PLC based BCS.
6. Enclosure(s) for controls.
7. A single power cable for connecting to generator.
8. Single point of connection for gas (propane).
9. Termination points for PLC input/output points.
10. All components shall be pre-piped and pre-wired.

F. The skid mounted burner system shall be suitable for outdoor use and include the following:
1. Totally enclosed fan cooled motors.
2. NEMA 4X enclosures for switches, valve actuator, solenoids, etc.
3. Factory applied epoxy coating to completed assembly to resist corrosion.
4. Heating and or cooling of panels, as required by components, in accordance with Section 13460.

2.3 GENERAL – CONTROL SYSTEM CONFIGURATION
A. The intent of the Specifications and Drawings is to obtain a control system which shall provide the following:
1. All required flame safety and burner, fuel, and combustion air related controls.
2. The process controls as shown on the Drawings and described in the Sequence of Operations (Section 13415).

B. The control system shall be provided, integrated, and coordinated by the burner manufacturer.

C. Skid mounted flame safety and BCS control panel(s):
   1. NEMA 4X.
   2. General panel construction as per Section 13460.
   3. Compression fittings for cables or other means of maintaining panel NEMA integrity (specifically with regards to field routed thermocouple cables which must be landed on terminal strips within same).
   4. BCS components as specified in Section 13450.
   5. Main breaker sized as per the burner skid requirements.

2.4 SYSTEM ACCESSORIES

A. Provide thermocouples as follows:
   1. Quantity: 15 (12 for use, 3 spares).
   2. Type: K.
   3. Lead Wire Material: Q-Fibre with stainless steel overbraid (suitable for use at temperatures up to 1200°F).
   4. Lead Wire Length: 50-feet.
   5. Lead Wire Termination: bare ends.
   6. End Type: Gasket, copper, for ¼-inch bolt, lead wires begin at gasket.
   7. Model and Manufacturer: Gasket type thermocouples as manufactured by Thermo Electric, Saddle Brook, NJ, Phone: 201-843-5800.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The system, including accessories, shall be installed in strict accordance with the manufacturer’s recommendations and applicable fire codes.

3.2 FIELD QUALITY CONTROL

A. Inspections:
   1. The installed system shall be inspected and approved by the manufacturers representative.

B. Manufacturer’s Field Services:
   1. Supervise and assist with installation.
   2. Certify installation.
   3. Supervise start-up.
4. Train operators on use of system and controls.
5. Include four days of on site time for above.

END OF SECTION
SECTION 13201

PROPANE FUEL SYSTEM

PART 4 - GENERAL

4.1 SUMMARY

A. Section includes: Equipment and accessories required for a complete temporary propane fuel delivery system, that satisfies all applicable state and federal codes.

4.2 SYSTEM DESCRIPTION

A. Propane delivery pressure to burner (gas): 20 PSIG.
B. Propane delivery rate to burner (gas): 1000 CU FT/HR maximum.
C. Propane system location: Outdoors.
D. Maximum distance from propane tanks to burner: Obtain distance from Owner.

PART 5 - PRODUCTS

5.1 SUGGESTED SUPPLIER

A. Local vendor.

5.2 PROPANE SYSTEM

A. Propane fuel system shall include the following:
   1. Tanks: quantity and size as required to satisfy the delivery rate for up to 24-hours of operation.
   2. Gauge on each tank showing remaining fuel.
   3. Regulators.
   4. Manifold piping at tanks.
   5. Piping between tanks and burners: sleeved polyethylene.
   6. Delivery, setup, installation of piping, and connection to burner.
   7. Fuel delivery.
   8. Removal of equipment after project completion.

PART 6 - EXECUTION

6.1 SURFACE PREPARATION

A. Advise owner of required site preparation, size of area, etc.
6.2 INSTALLATION

A. Provide complete setup, installation, and removal of system.

END OF SECTION
SECTION 13202

DIESEL FUELED GENERATOR SYSTEM

PART 7 - GENERAL

7.1 SUMMARY

A. Section Includes: Equipment and accessories required for a complete temporary diesel fueled generator system, that satisfies all applicable state and federal codes.

7.2 SYSTEM DESCRIPTION

A. Voltage: 240 VAC, 3-phase.
B. Generator main breaker size: 70-amps.
C. Fuel supply: diesel, sufficient for 16-hours of operation at ¾ load.
D. Configuration: trailer mounted or portable.

PART 8 - PRODUCTS

8.1 SUGGESTED SUPPLIER

A. Fidelity Engineering
   Attention: Charlie Hicks
   25 Loveton Circle
   Sparks, MD 21152
   Phone: 410-771-9400

8.2 DIESEL FUELED GENERATOR SYSTEM

A. Generator system shall include the following:
   1. Generator.
   2. Ground rod.
   3. Ground conductors.
   4. Power cable to end user.
   5. Delivery, setup, installation of ground rod, and power cable.
   6. Removal of equipment after project completion.

B. Ground rod:
   1. Provide a 10-foot by ¾-inch copper clad ground rod.
   2. Drive ground rods near generator.
   3. Bond to generator frame with #4 grounding conductor.
C. Power cable:
1. Provide power cable from generator to end user (estimated length 150-feet).
2. Connect power cable to generator and route to end user.
3. Power cable size: 3-#4 with #8 ground (based on 70 amp generator breaker).
4. Continuous, no splices.
5. Stranded copper conductors.
6. Rated at 90°C.
7. Suitable for outdoor use and resistant to oil, sunlight, ozone, grease, acids, water, abrasion, and impact.

PART 9 -EXECUTION

9.1 INSTALLATION

A. Provide complete setup, installation, and removal of system, including:
1. Delivery of generator to site.
2. Drive ground rod and bond to generator frame.
3. Connect power cable and route to end user.
4. Remove system after project completion.

END OF SECTION
SECTION 13415

SEQUENCE OF OPERATION

PART 10 - GENERAL

10.1 SUMMARY

A. This Section specifically describes the overall function and magnitude of the Burner Control System (BCS) for the range pile decontamination system.

B. The BCS shall provide the functions in accordance with the process and instrumentation diagrams (P&ID’s) and the sequence of operations.

10.2 CONTROL PHILOSOPHY

A. The BCS shall be provided by the burner manufacturer and be part of an integrated burner system. The major components shall include:
   1. A hardwired burner flame safety system located on the burner skid. The flame safety controls and interlocks shall be as required by NFPA.
   2. A programmable logic controller (PLC) located on the burner skid. The PLC shall provide burner firing rate controls and logic for the decontamination system as described below.
   3. A personal computer based operator workstation (OW) running an off the shelf process monitoring and control software package. The OW shall be located remotely from the burner/pile (outside the radius of safety) and shall be used to monitor parameters, adjust setpoints, and collect historical data.

B. The OW shall communicate with the PLC using wireless spread spectrum modems.

C. General Programming Requirements:
   1. No attempt has been made to show on the Drawings or describe in the Specifications all required time delays and dead bands.
   2. Provide sufficient time delays and dead bands on alarm and control points in order to prevent nuisance alarms and or false starts and trips.
   3. Coordinate with the equipment suppliers or refer to the appropriate Shop Drawings or As-built drawings to determine the exact requirements for each signal.
   4. When software based PID controllers are used, provide the necessary logic to enable and disable the controllers, to enable and disable output tracking routines, and massage other module specific parameters, as required to eliminate wind-up and to provide and maintain accurate process control.
   5. Provide filtering, averaging, and rounding of process variables as required to allow accurate process control.
PART 11 - PRODUCTS (SEQUENCE OF OPERATION)

11.1 DECONTAMINATION SYSTEM - GENERAL

A. This system will be used to decontaminate explosives contaminated scrap metal using Hot Gas Decontamination (HGD) technology.

B. HGD technology uses controlled heat to volatilize and thermally decompose explosive contamination.

C. The system shall be designed to be portable such that it can be taken to the scrap piles typically found on Army firing ranges. In general the system shall include the following:
   1. A skid mounted burner and control system to control and deliver the required heat (provided by the burner manufacturer).
   2. Insulating blankets to cover the scrap pile and retain the heat.
   3. Flame resistant blankets to protect the insulating blankets in the vicinity of the flame.
   4. Portable burner fuel tanks.
   5. Portable generator to produce the required electricity.

D. Systems and equipment design shall be suitable for outdoor use and exposure to the elements.

11.2 DECONTAMINATION SYSTEM PROCESS CONTROLS (Drawing I-02)

A. The following logic and functions shall be part of the burner manufacturer supplied BCS.

B. Scrap Pile Temperature Monitoring:
   1. Twelve thermocouples (TE-0500-1 through TE-0500-12) will be strategically placed within the scrap pile and shall be used to measure the temperature throughout the pile.
   2. The thermocouple temperature signals shall be input to the PLC and used for the control functions described below.
   3. The individual thermocouple temperature signals shall be displayed (TI-0050-1 through TI-0050-12) and recorded (TIR-0050-1 through TIR-0050-12) at the OW.
   4. A software selector switch shall be provided at the OW for each thermocouple signal (HS-0050-1 through HS-0050-12).
   5. The selector switches shall allow an operator to choose which thermocouple temperature signals will be used by the control logic.
   6. The thermocouple temperature signals selected by the operator shall be input to software function TY-0050-A and TY-0050-B.
7. TY-0500-A shall select the highest thermocouple temperature signal. The high temperature signal shall be displayed (TI-0500-A) and recorded (TIR-0500-A) at the OW.
8. TY-0500-B shall select the lowest thermocouple temperature signal. The low temperature signal shall be displayed (TI-0500-B) and recorded (TIR-0500-B) at the OW.

C. Burner Firing Rate Controls:
1. The high and low temperature signals (TI-0050-A and -B) shall be used for burner firing rate control.
2. Two software based temperature controllers shall be provided, TIC-0050-A and TIC-0050-B. Each shall have a setpoint entered by an operator at the OW.
3. TIC-0050-A shall be used as an override to control burner firing rate when the pile temperature approaches the maximum operating temperature of any component exposed to the heat. The setpoint of TIC-0050-A shall be adjustable and will be set to the lowest of the components maximum operating temperature. TIC-0050-A shall use the highest temperature signal (TI-0050-A) as its process variable. The controlled output shall be used to modulate the burner firing rate when selected by TY-0500.
4. TIC-0050-B shall normally be used to control burner firing rate and shall attempt to maintain the scrap pile at the decontamination temperature setpoint (adjustable). TIC-0050-B shall use the lowest temperature signal (TI-0050-B) as its process variable. The controlled output shall be used to modulate the burner firing rate when selected by TY-0500.
5. TY-0500 shall output a signal to the burner firing rate controller. The lowest of the two signals from TIC-0500-A or TIC-0500-B shall be selected by TY-0500 and used to control the burner firing rate.
6. A high temperature alarm (TAH-0050-A) shall be annunciated at the OW when the high thermocouple temperature signal exceeds the setpoint of TIC-0050-A for a preset amount of time.

D. Burner System Start-Stop Control (manual):
1. A LOCAL-REMOTE selector switch shall be provided at the burner panel.
2. When in LOCAL, the burner shall be controlled by pushbuttons and selector switches located at the burner panel. These controls shall be provided for maintenance and troubleshooting purposes.
3. When in REMOTE, the PLC based controls shall be enabled as described below.
4. When the burner is started (from the burner panel or from the PLC), it shall go through a preprogrammed purge cycle.
5. The purge cycle shall use the combustion air blower to purge the pile prior to igniting the burner.
6. The purge time remaining shall be displayed at the OW (KI-0030).
7. The exact burner start up sequence and interlocks shall be as required and recommended by NFPA and the burner manufacturer.

E. Burner System Start-Stop Control (automatic):
   1. The following controls require the burner panel to be in REMOTE.
   2. Normally the burner will be started by the operator from the OW and stopped automatically when the decontamination process is complete.
   3. Burner/sequence start shall be initiated with the START-STOP pushbuttons (HS-0050 located at the OW).
   4. The burner operating status shall be indicated at the OW with (OI-0040).
   5. When operating, the burner firing rate shall be controlled as described above.
   6. When the minimum decontamination temperature is reached (when TI-0050-B is greater than or equal to the setpoint of TSH-0050-B), the following shall occur:
      a. TAH-0050-B shall indicate that all thermocouples are at or above decontamination temperature.
      b. Software decontamination duration timer KS-0050-B shall start timing. The setpoint of KS-0050-B shall be adjustable from the OW. The time remaining in the decontamination period shall be displayed at the OW also.
   7. The burner shall continue operating until one of the following occur:
      a. KS-0050-B expires, indicating the end of the decontamination period.
      b. The STOP pushbutton (HS-0500) is pressed by an operator at the OW.
      c. Radio modem communication is lost as described below.
   8. KS-0050-B shall be interrupted (not reset) if TI-0050-B drops below the decontamination temperature setpoint by more than 50-degrees.

F. Loss of Communications Interlock:
   1. The OW shall be located in a shelter located outside the radius of safety (expected to be 1250 to 1800-feet).
   2. The OW shall communicate with the PLC using wireless modems.
   3. Communications between the PLC and OW shall be continuously monitored by establishing a heart beat between the two.
   4. The OW shall be programmed to periodically (every 5-seconds for example) reset a status bit in the PLC.
   5. The PLC shall subsequently set the same status bit high.
   6. A timer circuit shall monitor the status bit. If the status bit remains high for more than 60-seconds, communications shall be considered failed.
   7. If communications fail, the burner shall be stopped and an alarm annunciated at the OW (XA-0040).
   8. The burner stop command and alarm shall be latched in until communications is reestablished and the condition is RESET by the operator at the OW (using HS-0040).
G. Alarms and Indication:
1. In addition to above, the following conditions shall be annunciated at the OW:
   a. Low combustion air pressure (PAL-0030).
   b. Low fuel pressure (PAL-0040).
   c. High fuel pressure (PAH-0040).
   d. Others as required/recommended by the burner manufacturer.
2. In addition to above, the following status conditions shall be indicated at the OW:
   a. Combustion air blower run (MX-0030).

11.3 HISTORICAL DATA COLLECTION

A. In addition to the temperature signals mentioned above, the following signals shall be recorded:
   1. OI-0050, burner operating status.
   2. TY-0050, burner firing rate.

PART 12 - EXECUTION

Not Used.

END OF SECTION 13415
SECTION 13450

CONTROL COMPUTERS AND PROGRAMMABLE LOGIC CONTROLLERS

PART 13 - GENERAL

13.1 SUMMARY

A. Section Includes:
   1. Programmable Logic Controller (PLC) and Input/Output (I/O) hardware.
   2. PLC application program development.
   3. Operator Workstation (OW) hardware.
   5. PMCS application program development.

B. Related Sections:
   1. Section 13200 - Burner System.
   2. Section 13415 - Sequence of Operations.
   3. Section 13460 - Unit Control Panels.

13.2 REFERENCES

A. ANSI - American National Standards Institute
B. IEEE - Institute of Electrical and Electronics Engineers
C. NEMA - National Electrical Manufacturers Association
D. NIST - National Institute of Standards and Technology

13.3 GENERAL REQUIREMENTS

A. This section describes the work required to design, provide, program, install, and start-up a PLC based Burner Control System (BCS).

B. The BCS shall include:
   1. A skid mounted PLC based control system.
   2. A remote mounted PC based operator workstation (OW).

C. Provide all devices, accessories, programming and appurtenances required for proper operation of the BCS.

D. Develop and provide the PLC and OW PMCS application programs and hardware required to direct the equipment to perform the functional requirements specified in Division 13 or as required by the burner equipment.
E. Provide the PLC and OW hardware required to interface with and direct the equipment to perform the functional requirements specified in Division 13 or as required by the burner equipment.

F. Develop and provide PLC application programs, other equipment configuration and programming, hardware, cabling, and devices required to establish and maintain communications between the various items of equipment as specified and shown on the Drawings.

G. Refer to the P & ID’s, Sequence of Operation (Section 13415), and burner equipment manufacturers requirements for interlock and control functions.

13.4 SUBMITTALS

A. Manufacturer's Product Data.
   1. Provide complete legible manufacturer’s product data for each item of equipment.
   2. Clearly identify options being provided.
   3. Neatly strike out options not being provided.

B. Manufacturer’s Installation Instructions.

C. A complete set of manufacturers Reference, Programming, and other related manuals for the PLC and OW hardware and PMCS software.

D. Shop Drawings, include the following as a minimum:
   1. BCS block diagram.
   2. Assembly of equipment and related accessories.
   3. Interconnections between I/O hardware and interconnected field equipment and devices.
   4. Interconnections between PLC, I/O, communications, and other modules.
   5. List and settings for hardware and software configurable parameters.

E. Application Programs.
   1. Printed copies of the fully annotated PLC ladder logic programs.
   2. Printed copies of the fully annotated OW graphic displays and related application programs, including alarm listings, trending information, etc.
   3. As-built PLC and OW PMCS application programs on magnetic media.

F. Operations and Maintenance Manual Data as per Section 13200.

13.5 QUALITY ASSURANCES

A. License Agreements and Security.
1. Application programs shall become the property of the Owner at the conclusion of the contract.
2. There shall be no license agreements of any kind for application programs.
3. This requirement may not apply to software source code as provided by a product manufacturer. These programs shall be licensed directly to the owner.
4. The Owner shall be provided with all passwords required to access the PLC software and OW PMCS. There shall be no programmed security schemes which prevent access to software.
5. PMCS software shall be licensed directly to the Owner.

PART 14 - PRODUCTS

14.1 PLC AND I/O EQUIPMENT - GENERAL

A. The PLC and I/O components shall be assembled into the burner control panel.
B. Each I/O location shall be provided with sufficient modules to allow spare installed and wired I/O points. 20% spares shall be provided for each different type of I/O.
C. Provide a unique I/O module point and the associated terminal blocks for each required I/O point.
D. PLC Programming:
   1. Perform in a neat, professional, logical, and efficient manner such that the available PLC memory is sufficient for the required application programs.
   2. Completely document with detailed rung comments and address comments which correspond to tag numbers provided on the P&ID's and in the Sequence of Operations.
   3. Programming that manipulates analog signals shall utilize values that are scaled in the proper engineering units and are of the correct magnitude.

E. Software, general:
   1. All software required for the project shall be turned over to the Owner at the conclusion of the project.
   2. The software shall be in like new condition and include all boxes, manuals, media, and registration cards.
   3. All software shall be registered to the Owner.
   4. If, in the opinion of the Owner, the turned over software is deficient in any way, new software packages shall be provided to replace same.
   5. All software (including pre-loaded) shall be provided on compatible media.
   6. The following types of software shall be turned over:
      a. OW PMCS.
      b. OW hardware Operating Systems.
      c. Drivers.
      d. Any equipment or hardware related proprietary software.
e. Any other software required for the project.

14.2 PLC SOFTWARE AND OW PMCS DEVELOPMENT

A. Software development shall consist of the creation of the PLC ladder logic, system database, logging, operator interface display screen formats, and other required modules.

B. Furnish all materials and programming required for software development.

C. Provide all application programming work and produce annotated documentation to support the programming effort. Documentation shall include complete and detailed network/rung, database, and address descriptors. Descriptors shall describe logic, interfaces with OW, setpoints, calibrated ranges, constants, and shall include tag numbers from Drawings and Specifications (where applicable).

D. Use the system descriptions from Section 13415, process and instrument drawings (P&ID's), burner equipment manufacturer supplied information, and other application-oriented documents to develop the PLC and PMCS application programs.

E. The application programming to develop displays for the OW’s shall be provided. The types of displays typically include: process equipment graphics, continuous control and indication graphics, historical data trend graphics, and alarm logs in tabular format.

F. Develop the layout or arrangement format for each of the types of graphic and tabular displays. Each basic format shall be expanded as necessary. Graphic displays shall be interactive with the system and shall provide both an overview and a more detailed presentation of each process area. The graphic displays shall be developed from the P&ID's and Sequence of Operations. No attempt has been made to show or describe all required components of the graphic displays in the Contract Documents. Provide all information required to clearly convey the operational status of the process systems and equipment.

G. Trend (on-line and historically) all monitored and calculated signals unless otherwise directed.

14.3 PLC AND I/O HARDWARE

A. Provide PLC hardware, including processors, power supplies, rack assemblies, interconnecting cables, grounding system, modules, and accessories required to perform the control and monitoring functions described in Division 13 and as shown on the drawings, as follows:

1. Configuration: Modular, primary subrack mounting.
2. User memory (logic/data): provide as required for applications program, non-volatile protected by a battery.
3. Minimum standard instruction set: Contacts, coils, latches, timers, counters, and special function blocks for math (double precision and floating point), trigonometry, sequences, data transfer, and PID control.
4. Operating power: 120 vac to power supply.
5. External communications:
   a. RS-232 port – use for communications with OW via wireless modem (Allen-Bradley DF-1 or Modicon Modbus).

B. Provide PLC I/O hardware of the quantities and types required to accommodate the I/O points identified in Division 13 and as shown on the drawings as follows:
   1. Configuration: Mounted in PLC primary subrack and expansion subracks as required.
   2. Standard analog signals: 4-20 mAdc current and thermocouple.
   4. Maximum point density per module: 16.

C. Manufacturers and model numbers:
   1. PLC hardware:
      a. TSX Momentum as manufactured by Modicon.
      b. SLC 500 as manufactured by Allen-Bradley.

14.4 PLC PROGRAMMING SOFTWARE

A. Provide for programming, start-up, and troubleshooting system.

B. Does not have to be provided to Owner.

14.5 PLC PROGRAMMING TERMINAL

A. Provide for programming, start-up, and troubleshooting system.

B. Does not have to be provided to Owner.

14.6 OW HARDWARE

A. Provide a standard personal computer to serve as the OW with the following minimum features:
   1. Case: Tower or Mini-tower.
   2. Video card: 64-bit, AGP, PCI, with 16 MB memory.
   3. Processor (minimum): Intel Pentium III, 500 MHz with 512 KB integrated L2 cache.
4. Memory: 128 MB, 100 MHz, ECC, SDRAM.
7. Internal drive: 100 MB ZIP.
9. Operating System: Windows NT or as required by the PCMS.
10. CD ROM: 48X maximum/variable speed.
11. Surge protection: To protect all components.

B. Provide a monitor for the OW computer with the following minimum features:
2. Tube: Trinitron (no Invar mask).
3. Resolution: 1280 X 1024 non-interlaced.
4. Refresh rate: At least 60Hz. at highest resolution.
5. Dot pitch: .26mm.
7. EPA Star MPR-II complaint.
8. Compatible with OS.

C. Manufactures and model numbers:
1. OW computer: Dell or equal.
2. Monitor: Dell, Sony, Mitsubishi, or equal.
3. Video card: Diamond, ATI, nVidia, or equal.
4. Surge Protection: APC, TrippLite, or equal.

14.7 PMCS

A. Provide a PMCS software package with the following features:
1. Operating system: Microsoft Windows NT.
2. Standard Windows user interface.
3. Graphical editor with library of symbols.
4. ODBC compliant database.
5. User security.
7. Historical data collection.
8. Trending: line graphs, bar graphs, real time and historical data.
9. Data export capability.
10. Alarm management: Limit, deviation, rate of change, or discrete alarms, and view, acknowledge, and clear capabilities.
11. Animation capabilities for process visualization (color, fill, slider, rotation, touch, etc).
12. Drivers for PLC hardware specified herein.
13. Package size: As required by the total number of hardware and software points.
B. Acceptable Packages:
1. Genesis 32 as manufactured by Iconics.
2. RSView 32 as manufactured by Rockwell Software.
3. Process Window as manufactured by Taylor Industrial Software.
4. Or equal.

14.8 WIRELESS SPREAD SPECTRUM RADIO MODEMS

A. Provide radio modems for communicating between the BCS PLC and OW as follows:
1. Range: up to 20-miles with line of sight antennas.
2. Frequency range: 902 to 928 MHz, no FCC license.
3. RF output power: 0.1 to 1 watt, user selectable.
4. Spreading function: frequency hopping, 112 channels.
5. Hopping code: 15 user selectable algorithms.
8. Indicators: power, carrier, data in, and data out.
9. Enclosure: flange mount or PLC slot mount.
10. Operating temperature: -40°C to 75°C.
11. Operating humidity: 0 to 95 percent, non condensing.

B. Antennas:
1. Burner skid:
   a. External.
   b. Omni directional.
   c. Whip.
   d. Bracket mount.
   e. With cable, length as required.
2. Operator Workstation:
   a. External.
   b. Omni directional.
   c. Whip.
   d. Magnetic mount.
   e. With 20-feet of cable.

C. Manufacturer and model number:
1. SRM6000 Radio Modem as manufactured by Data-Linc Group.
2. Or equal.
PART 15 - EXECUTION

15.1 INSTALLATION

A. The installation of the equipment shall be in accordance with the drawings, specifications, and equipment manufacturer's recommendations and the applicable codes.

END OF SECTION
SECTION 13460
UNIT CONTROL PANELS

PART 16 - GENERAL

16.1 SUMMARY

A. This Section defines the construction, components, and level of quality required for:
   1. Skid mounted burner control panels.

B. This Section describes the equipment and devices most commonly used for this type
   of panel construction and does not attempt to address every possible device that may
   be used. Devices and equipment not specifically addressed in this Section shall be of
   the same general quality (industrial-type control) as described in this Section.

C. Related Sections:
   1. Section – 13200 Burner System.
   2. Section – 13415 Sequence of Operation.

16.2 REFERENCES


B. IEEE - Institute of Electrical and Electronic Engineers:
   1. ANSI/IEEE C62.41-1991 - Recommended Practice on Surge Voltages in Low
      Voltage AC Power Circuits.

C. NEMA - National Electrical Manufacturers Association.

D. ISA - The International Society for Measurement and Control:
   1. ANSI/ISA-RP60.9-1984 - Nameplates, Labels, and Tags for Control Centers.
   2. ANSI/ISA RP60.8 - Electrical Guide for Control Centers.
   3. ANSI/ISA RP60.9 - Piping Guide for Control Centers.
   4. ANSI/ISA-RP12.6-1987 - Installation of Intrinsically Safe Systems for
      Hazardous (Classified) Locations.
   5. ISA/ANSI-S5.4-1989 - Instrument Loop Diagrams.

E. NIST - National Institute of Standards and Technology.

F. NFPA 70, Article 504 - Intrinsically Safe Systems.

16.3 SUBMITTALS

A. The following general guidelines shall be used in preparing submittals:
1. Manufacturer's specification or data sheets shall be clearly marked to delineate the options or styles to be furnished. Options or equipment not being provided shall be neatly crossed-out.

2. Submit only complete systems, not pieces of equipment from various systems.

3. Submittals shall reference assigned equipment and device tag numbers.

4. Submittals not following these and related requirements will be returned without review.

B. Shop Drawings, showing:
1. Assembly and arrangement of equipment and related accessories.
2. Dimensional and structural drawings and details.
3. Physical configurations.
4. Methods of connecting instruments together.
5. Equipment mounting details.
6. Panel graphic drawings, where applicable.
8. Tubing diagrams.
10. Interconnection diagrams.

C. Electrical Control Schematics:
1. In ladder diagram format.
2. Complete with tag, terminal, and device numbers.
3. Include a written description of operation for all panel functions.

D. Equipment Specification Data Sheets (ESDS), including:
1. Separate ESDS for each item or type of equipment.
2. Use ESDS as cover sheet for related item submittal information.
3. A summary of specification features as required by the Specifications.
4. All information required to reorder an exact duplicate of the original item from the manufacturer.
5. The assigned tag number.
7. Manufacturer's part number (this shall not be considered as a substitute for any of the required statement of specifications).
8. Panel and breaker from which item receives power.
9. More than one tag numbered item may be included on a sheet.

E. Manufacturer's Product Data.
1. Provide complete legible manufacturer's product data for each item of equipment.
2. Clearly identify options being provided.
3. Neatly strike out options not being provided.

F. Instrument and Device Parameter Configuration Data Sheets.
1. Provide blank sheets with initial submittal.
2. Complete sheets during installation, calibration, and start-up.
3. Include As-Built sheets with Operations and Maintenance Manuals.

G. Manufacturer’s Installation Instructions.
H. Manufacturer’s Users, Programming, and other related manuals.
I. Proposed wording for identification nameplates and tags.
K. As-built drawing package for storage within panel.

16.4 QUALITY ASSURANCES

A. Panels shall be manufactured, assembled, wired, and tubed by a firm regularly and currently in the practice of building industrial type control panels and consoles.

B. Panels shall not be fabricated in the field.

C. Panels shall be furnished completely pre-wired and pre-piped, with factory-mounted instruments, controls, and PLC and I/O equipment.

D. Panels shall be factory-tested prior to shipment.

PART 17 - PRODUCTS

17.1 PANEL CONTROL FUNCTIONS

A. Panels shall provide the control functionality required by:
   1. Section 13415.
   2. The burner manufacturer.
   3. The Drawings.

B. Panel control logic shall provide all required equipment and system interlocks, whether shown on the Drawings, specified, or not.

C. Conflicts shall be submitted to the Engineer for a no cost resolution.

17.2 GENERAL PANEL CONSTRUCTION

A. Wiring:
   1. Wiring shall be enclosed in plastic wireways and neatly tied with plastic ties.
   2. Sufficient empty wireways and space shall be provided for routing of field wiring.
3. Route signal cables (analog, discrete, and digital communication) and power wiring in separate wire ways to eliminate interference and noise.
4. Wireway and terminal block spacing per ANSI/ISA RP60.8.
5. Wires shall be color coded per ANSI/ISA RP60.8. 24 VDC power wiring shall be orange.
6. Wiring entering and leaving the panel shall terminate a terminal blocks and shall be tagged to facilitate field connections.
7. Terminals on equipment shall be connected with the proper compression lug.
8. Wiring shall be in accordance with ANSI/ISA RP60.8.
9. Wiring for discrete signals shall be 16 AWG stranded with 600 volt PVC insulation, except where larger wire sizes are required for a single load.
10. Wiring for analog signals shall be 18 AWG stranded, twisted-shielded with drain wire.
11. Thermocouple extension wire shall be 16 AWG, solid, twisted-shielded with drain wire, selected for the thermocouple type.
12. Cabling for digital communications shall be as required for the signal type.
13. Power wiring shall be sized for the current to be carried.

B. Grounding Bus:
1. Provide internal copper grounding bus.
2. Size as required for number of ground conductors.

C. Instrument Air Tubing:
1. Stainless steel, tool bent.
2. Provide dual supply manifolds complete with pressure reducing valves and gauges.
3. Provide isolation valves at each component to permit servicing without shutdown of the air supply.
4. All connections shall be made with Swagelock 316 stainless steel compression type fittings.
5. Grouped and supported to give a neat appearance.
6. Pneumatic signal lines entering and leaving the panels shall terminate at bulkhead fittings and shall be tagged to facilitate field connections.
7. In accordance with ANSI/ISA RP60.9.

D. Wiring and Tubing Identification:
1. Identify each end of each wire and tube.
2. Labels shall be machine printed.
3. Self-laminating or heat shrink tube type labels.
4. Panduit or equal.

E. Size, Supports, and Mounting:
1. Panels shall be of sufficient size to adequately enclose instruments designated as panel-mounted plus ample interior clearance to allow for installation, general servicing, and maintenance of the instruments.
2. Provide mounting channels for fastening sub-panels, racks, instruments, and accessories.
3. Weight of instruments shall be supported by mounting channel supports
   Channels shall be supported by panel base framing.
4. Mount all devices and equipment on sub-panels and or support from mounting channels.
5. Control components not flush-mounted on the front of the panel shall be mounted on fully accessible sub-panels or racks within the panels for easy removal.
6. Minimum nominal panel size shall be as indicated on the drawings or specified herein.
7. Device and component attachment methods shall be detailed on shop drawing submittals.

F. Doors and openings:
1. Provide doors in panels to give access to panel interior.
2. Provide a side or rear opening door where instruments are mounted in the panel face unless otherwise specified.
3. Provide oil-resistant door gasket, attach with oil-resistant adhesive and retaining clips.
4. Hinges shall be full-length piano type.
5. Doors shall be set flush with 3-point vault-type key-locking latches in addition to any required screw clamps.
6. Hardware and handles shall be stainless steel.
7. All panel locks shall be keyed alike unless otherwise specified.

G. Control Voltage:
1. The control voltage shall be 120 VAC.
2. Control voltage shall be supplied from and internal control power transformer or from the power panels supplied under Division 16, as appropriate or as shown.
3. Circuit breakers shall be installed in the panel for each incoming 120 VAC power source.
4. Separate low-voltage circuits shall be provided within the panel for lamps, components, or as required.
5. Indicating lamps shall be wired to a master lamp test relay assembly or individual push-to-test lamps shall be provided.
6. Safety interlock switches, not shown in the schematics, shall be provided on access doors for local and foreign voltages as required by safety codes of applicable regulating authorities.
H. Arrangement:
   1. Where so indicated, the instruments mounted in the panels shall have the
      nominal size and general arrangement shown.
   2. Panel layouts and nameplates shall conform to the approved shop drawings.

I. Nameplates:
   1. All devices mounted on and within the panel shall be provided with device
      nameplates.
   2. The nameplate nomenclature shall agree with the tag numbers and descriptions
      on the equipment or Drawings, when provided.
   3. Nameplates shall be white laminoid with black lettering.
   4. Nameplates shall be the same size, as much as practical.
   5. Panel nameplates: At least 1 1/2-inches high by 6-inches wide and shall include
      the panel number and the panel name.

J. As-built drawing package for storage within panel:
   1. Provide a complete as-built drawing package for each panel.
   2. Drawing packages shall be provided in a waterproof envelope.
   3. Provide a pocket for storing drawing packages in each panel.
   4. Store drawing packages in each respective panel.
   5. These drawings shall be in addition to those provided with the Operations and
      Maintenance Manuals.

17.3 MATERIALS OF CONSTRUCTION

A. STAINLESS STEEL PANELS
   1. Stainless steel panels shall be made of 304 stainless steel and have a smooth
      brushed finish.
   2. Construction requirements are the same as for steel panels except painting and
      finishing are not required.
   3. Mounting brackets and hinges shall be 304 stainless steel.
   4. When size and configuration permits, a standard industrial panel
      manufacturer’s enclosure may be used.

B. NON-METALLIC PANELS
   1. Nonmetallic panels shall be made from fiberglass reinforced polyester.
   2. The enclosure and door shall each be of single piece construction, without
      glued joints.
   3. The panels shall be suitable for use in temperature extremes of -50 to 300
      degrees F.
   4. The panels shall be provided with flush non-metallic key locking handles
      which operate an internal five point latching system.
   5. A standard industrial panel manufacturer’s enclosure shall be used.
17.4 PANEL ACCESSORIES

A. Specific devices, instruments, and equipment shall be as specified in other Sections, or shall be manufacturer's standard.

B. PLC, I/O, telemetry, and fiber optic equipment, and MMI computer equipment, shall be as specified in Section 13450.

C. Selector switches, push-buttons, and potentiometers:
   1. Oil-tight or NEMA 4X as required.
   2. 30.5 mm.
   3. Bulletin 800 as manufactured by Allen-Bradley, or equal.

D. Pilot lights:
   1. Cluster LED type.
   2. 30.5 mm.
   3. Type 8415, as manufactured by Stahl.

E. Lighting and receptacles:
   1. Panels larger than 36-inches high by 36-inches wide shall be internally lighted by fluorescent lamps, provided with guards.
   2. Provide a 3-way switch located convenient to each access door where applicable.
   3. Provide two duplex grounded receptacles in each panel section.
   4. Lights and receptacles shall be wired to outgoing terminal blocks for 120 VAC, 60-Hertz, single-phase supply.
   5. When the panel houses PLC or I/O equipment, the lights and receptacles shall be powered from a circuit separate from the PLC or I/O equipment.
   6. Lights shall be APX as manufactured by Hoffman.

F. Regulated 24 VDC power supplies (redundant):
   1. Provide to power analog control loops, instruments, and components as required.
   2. Power supplies shall convert input voltage of 120 VAC to an output voltage of 24 VDC plus or minus 5 percent with line and load regulation of 0.5 percent.
   3. The output current shall be as required for the application plus 20 percent spare capacity.
   4. Configure power supplies for true redundancy as follows:
      a. Provide two power supplies with integral redundancy modules or two power supplies with a single or dual external redundancy module as required by the manufacturer for the specific power supply.
      b. If a power supply fails it shall be removed from service and shall not impact performance of the remaining on line power supply.
      c. Provide dry contacts for each power supply indicating power supply status (DC power OK/DC power failed).
5. The power supplies shall be SDN Redundant Series as manufactured by Sola.

G. Terminal blocks:
1. Provide terminal blocks which are suited to the particular signal type.
2. Terminal blocks shall minimize the amount panel space consumed.
3. Terminal blocks shall be arranged/selected so that related wiring is located adjacent to each other or on the same terminal block.
4. General applications shall use a single point feed-through type terminal block.
5. Where control voltage originates within a panel and is wired to a device in the field (a discrete input for example), a combination fuse/feed-through type terminal block shall be used (with the returning signal on the feed-through portion).
6. Analog signals shall use a three-level terminal block (shielded cables shall be grounded in the control panels only).
7. Thermocouple signals shall use thermocouple type terminal blocks.
8. Provide individual terminals for all required tie points (one wire per terminal) and 20 percent spares.
9. Each terminal shall be clearly and neatly identified.
10. Terminal block manufacturers standard type jumpers shall be used for bussing signals and power when required.
11. Terminal blocks, breakers, and related accessories shall be as manufactured by Phoenix Contact or Weidmuller.

H. Power To Field Devices:
1. When field devices are provided which interface with the panel and require 120 VAC, they shall be powered from within the panel.
2. Provide terminal strips for each device.
3. Provide power for required devices and devices shown on the Drawings.

I. Heating, Ventilating, and or Air Conditioning:
1. Provide louvers when specified and when required.
2. Locate near the bottom and top on the rear doors and sides of panels.
3. Provide electrically powered, thermostatically controlled, heating, ventilating, and or cooling equipment as required by equipment and devices located within the panel.
4. Louver and fan filters: Removable and washable, A-FLT as manufactured by Hoffman.
5. Arrange equipment within panels according to manufactures instructions for proper equipment ventilation and heat dissipation.

J. Relays:
1. Provide relays to perform switching and interfacing functions required of control panels and other control circuits as follows:
a. General Purpose Relays: This type shall be used for logic and switching power to external loads and shall be general purpose industrial types. They shall be of the dust cover enclosed plug-in type with 8 or 11 pin, screw terminal, octal type sockets. Relays shall have up to 3 pole form C contacts rated for 10 amperes at 120 VAC and be equipped with neon indicator lamps.

b. Logic Switching Relays: This type shall be used for performing logic switching within panels using up to 6 pole form C contacts per coil. These relays shall be of the plug-in telephone type with transparent plastic dust covers and retainer bails or springs. Contacts shall be rated for 5 amperes, suppressed inductive loads, at 28 VDC or 120 VAC.

2. Manufacturers:
   a. Relays shall be as manufactured by Potter-Brumfield, IDEC, Automatic Electric, Solid State Advanced Controls, or approved equal.

3. Provide relays as required.

K. Corrosion Protection:
   1. Provide corrosion inhibiting vapor capsules.
   2. Quantity as required for panel size.
   3. Provide sufficient spares to provide protection for two years.

17.5 ELECTRICAL COMPONENTS

A. Single Phase Power Distribution:
   1. Provide power panel with main and branch circuit breakers.
   2. Provide branch circuit breakers for each feed leaving panel.
   3. Provide typed legend card.

B. Three Phase Power Distribution:
   1. Provide circuit breakers and motor starters as required.
   2. Provide motor overloads with manual RESET push-button on panel door.
   3. Provide control power transformers with minimum 100 VA spare capacity.

17.6 SPECIAL TOOLS AND ACCESSORIES

A. Furnish special tools, instruments, and accessories required to maintain the monitoring and control devices.

B. Furnish special lifting, handling, and storage devices for the monitoring and control devices when required.
PART 18 - EXECUTION

18.1 INSTALLATION

A. In accordance with the manufacturer's instructions and the approved shop drawings.

B. activities are concluded.

18.2 FACTORY TESTING

A. Pre-Factoy Acceptance Test Verification:
   1. Perform in-house testing of each panel in preparation for the Factory Acceptance Test.
   2. After each panel is assembled and completed, thoroughly inspect and test each panel to verify correct wiring and functionality.
   3. Simulate signals as required to test every device, instrument, loop, and control function provided by the panel.
   4. Verify communications and functionality between interconnected panels and between panels and other system components (remote I/O racks, PLC’s, Operator Workstations, etc.).
   5. Document each test performed and results obtained.
   6. Provide written confirmation upon completion of successful verification.

B. Factory Acceptance Test:
   1. Perform a Factory Acceptance Test for each panel before shipping to project site.
   2. Provide at least 14 days written notice to the Engineer and Owner so that a representative may be present.
   3. Test procedures shall be submitted and approved prior to scheduling the test.
   4. Test results shall be documented and submitted at the conclusion of the test.
   5. Documentation shall include an itemized line-by-line list of procedures performed and results.
   6. The test shall essentially duplicate the Pre-Facotry Acceptance Test Verification.

END OF SECTION
SECTION 15250
HIGH TEMPERATURE INSULATION

PART 19 - GENERAL

19.1 SUMMARY

A. Section Includes: High temperature insulation required for insulating the range residue pile.

19.2 MATERIALS DESCRIPTION

A. Insulation:
   1. Mineral or rock wool furnished in rolls.
   2. Maximum temperature limitation: 1200 to 1500°F.

B. Insulation quantity requirement:
   1. Approximately 750 square feet of insulation per range residue pile.
   2. At a minimum, procure at least sufficient quantities for insulating 2 piles (1500 square feet).
   3. Procure insulation in rolls 4 foot wide by standard manufacturer’s length.

PART 20 - PRODUCTS

20.1 SUGGESTED SUPPLIERS

A. Insulation (front half of pile closest burner):
   1. Ametek Pre-shrunk Silmat NOT DONE
      a. Manufacturer: Ametek, Chemical Products Division
         900 Greenback Road
         Wilmington DE 19808
         302-995-0400
      b. Procure 10 rolls of 1 inch thick (if available), 4 foot wide by 50 foot long; or 20 rolls of 1/2 inch thick, 4 feet wide by 50 feet long, (if 1 inch thick is unavailable).

B. Insulation (back half of pile furthest from burner):
   1. BGF Mat Insulation, High temperature fiberglass, 1-inch thick (preferred) or 1/2 inch thick (alternate) or approved equal.
      a. Manufacturer: BGF Industries
         3802 Robert Porcher Way
         Greensboro NC 27410
         800-476-4845 or 336-545-0011
         Fax 336-545-0011
         Email - ecox@bgf.com
b. Procure 10 rolls of 1 inch thick (if available), 4 foot wide by 50 foot long; or 20 rolls of 1/2 inch thick, 4 feet wide by 50 feet long, (if 1 inch thick is unavailable).

PART 21 - EXECUTION

21.1 INSTALLER'S SAFETY

A. Provide Material Safety Data Sheets for personnel protection requirements for installers.

21.2 INSTALLATION

A. Provide installation instructions for product.

END OF SECTION
SECTION 15251
HIGH TEMPERATURE THERMAL FABRIC

PART 22 - GENERAL

22.1 SUMMARY

A. Section Includes: High temperature thermal fabric required for insulating the range residue pile. The product is a one-of-a-kind material and there are no known suppliers of materials with similar properties.

22.2 MATERIALS DESCRIPTION

A. High temperature thermal fabric quantity requirement:
   1. Approximately 150 square feet of thermal fabric per range residue pile.
   2. At a minimum, procure sufficient quantities for insulating 3 piles (450 square feet).
   3. Procure thermal fabric in rolls 3 foot wide by standard manufacturer’s length.

PART 23 - PRODUCTS

23.1 SUGGESTED SUPPLIERS

A. High Temperature Thermal Blanket:
   1. Siltemp Silica Fabric Blanket, Abrasion Resistant, Product Number 84 CSR
      a. Manufacturer: Ametek, Chemical Products Division
         900 Greenback Road
         Wilmington DE 19808
         302-995-0400
      b. Procure 1 roll, 3 feet wide by 50 yards long; or approved equal.

PART 24 - EXECUTION

24.1 INSTALLER’S SAFETY

A. Provide Material Safety Data Sheets for personnel protection requirements for installers.

24.2 INSTALLATION

A. Provide installation instructions for product.

END OF SECTION
APPENDIX B

SOP FOR INSTALLATION OF TRANSPORTABLE HGD SYSTEM
STANDING OPERATING PROCEDURE

Decontamination of Explosives-Contaminated Firing Range Residue
Using Hot Gas Decontamination

PART 1 - GENERAL

1.1 SUMMARY

A. This document outlines requirements for range personnel to construct the range residue pile and to install the decontamination equipment and facilities. Refer to the Demonstration Plan for test objectives, test variables, test criteria, and other test details for conducting the demonstration test. Refer to the Specifications for procurement requirements relative to equipment and materials.

B. This document is intended to provide general guidelines during installation of the test pile, facilities and equipment.

PART 2 - PRODUCTS

A. Refer to the specifications for technical details regarding equipment and materials.

PART 3 - EXECUTION

3.1 PILE CONSTRUCTION

A. A typical pile size of 18-foot diameter with an 8-foot height in the center (in a semi-sphere shape) has been selected for design sizing of materials and equipment.

B. The ground underneath each test pile and in the immediate vicinity of the test pile shall be level and free of vegetation and debris. A gravel base may be used if appropriate. Vegetation and undergrowth shall be cut or removed within 100 feet of the test pile.

3.2 SAFETY

A. The safety of workers and the public health has the top priority in constructing the test pile and operating the demonstration test.

B. The range residue pile shall be constructed so as to minimize potential for both explosion and fire, due to spontaneous combustion of combustible materials exposed to the heat of the process. Fire extinguishers shall be provided. The installation Fire Protection Branch shall be briefed on the nature and hazards of the demonstration test.
c. If appropriate due to historical use, a geophysical survey shall be conducted at the site of each demonstration test pile for unexploded ordnance (UXO) lying underneath prior to construction of the range residue pile. Any UXO detected will be removed by qualified personnel or that particular site shall be avoided for conducting the demonstration test. There shall be no digging or intrusive activities prior geophysical survey for UXO. Also, at the site of the electric power generator, a geophysical survey for UXO shall be conducted for placement of the ground rod.

D. Range residue must be free from live munitions and quantities of explosive materials that create danger of detonation when test personnel and certified free of live munitions prior to placing in the pile.

E. The range residue pile shall be free of trash, paper, cardboard, and wood products, and limited to range residue (shrapnel and range target scrap metal).

F. A radius of safety has been established where operations personnel and installation personnel are prohibited from entering during HGD operation (when the burner is on). Due to uncertainties with regard to explosive hazards during the test, a conservative radius of safety has been established for the test of 1250 feet when the burner is operational. Operators are not permitted to enter the radius of safety while the burner is operating. The HGD system is designed to operate remotely from outside the radius of safety.

G. A decision on attended or unattended operation should be made by the Installation Safety Branch and Fire Protection Branch depending on such factors as fire hazard in the vicinity or type of scrap treated. The burner system is designed to shut down automatically similar to a home furnace in the event of most common failure scenarios such as loss of power or loss of fuel pressure.

H. Extra care shall be exercised by workers when handling (sharp) scrap metal when constructing the pile. Work gloves, steel toed boots, and long pants and long sleeve shirt will be required. Special care should be exercised when and if reaching into the pile is necessary to place or move coupons, thermocouples or thermocouple wires.

I. If practicable, a direct line of sight to the pile should be maintained from at least two vantage points outside the radius of safety. One of the vantage points should be from the Operator Workstation (OW) if practicable. However, line of sight from the OW is not an absolute requirement.

J. Closed circuit television (CCTV) may be used as needed for in-close visual monitoring of the pile or burner assembly during burner operations.
K. Non-participating installation personnel should be kept outside the radius of safety during operation.

3.3 SECURITY

A. The range residue piles should be secured within a fenced area. Security of the pile will be effective immediately at initiation of the pile construction with certified munitions-free scrap, to ensure that no uncontrolled, uncertified scrap is inadvertently placed in the pile. Temporary fencing and warning signs may be used for this purpose.

B. Range residue should be controlled and secured from the time it is certified as free from live munitions, until it is shipped off the installation to the appropriate receiving organization. Range residue that been decontaminated shall be loaded into lockable containers, and locked and tagged according to installation procedures.

a. THERMOCOUPLES

A. Twelve (12) thermocouples shall be used to monitor temperature at various locations in the pile and monitor progress of the heat in the pile. Thermocouples will be located in the pile, as shown schematically in Figure 3.4-2. Thermocouples and lead wires will be carefully placed near the outside of the pile (within one foot of the perimeter) and protected from damage during subsequent piling of scrap metal overtop. With exceptions stated below, the majority of thermocouples and their associated coupon holders shall be placed into the pile after the pile construction has been completed. Use of tongs for this work activity is suggested.

B. Three thermocouples shall be placed in the immediate vicinity of the burner exit (as shown in Figure 3.4-20, to monitor that the pile does not exceed maximum temperature limitation of the materials in the pile. These thermocouples shall be installed in a similar arrangement to as described in Item 3.4-A above. The maximum temperature limitation of the pile depends of the type of insulation blanket used in accordance with manufacturer’s recommendations.

D. Temperature profile data will be collected by the Operator Workstation (OW) during operations. Operations personnel shall produce a sketch of thermocouple locations within the pile. The sketch shall reference thermocouples by tag number and show their location. It is important that the correct thermocouple then be connected to the appropriate control system input. Using the sketch and thermocouple tag number, the temperature profile within the pile can be accurately analyzed.
3.6 **BURNER**

E. Thermocouple wires shall exit the pile such that they can be routed to the burner control panel. Thermocouple wire shall not be placed under or through the pile.

### 3.5 INSULATION AND THERMAL FABRIC

A. The range residue pile shall be insulated with standard industrial insulation and high temperature thermal fabric. Refer to the specifications for data sheets for insulation and high temperature fabric. The order of placement of materials is as follows:

**Bottom layer -** Wire mesh (stainless steel welded wire mesh) shall be used to support the insulation and prevent damage from sharp objects in the pile during installation. Baling wire may be used to hold the wire mesh strips in place. Landscape spikes shall be used to anchor the mesh to the ground as appropriate.

**Second layer -** High temperature thermal fabric shall be used in the immediate vicinity of the burner to seal the burner exhaust flange (shroud) to the pile and protect the insulation from exceeding manufacturer's recommended maximum temperatures. This material will be used over an estimated one-third to one-half of the pile. The thermal fabric should drape over the ground at the bottom of the pile by at least six inches, and should not fall short of the ground leaving an uninsulated space for heat to escape.

**Third layer -** The insulation layer shall be placed on top of the wire mesh (and thermal fabric as appropriate) to conform to the pile shape. Industrial insulation is planned for testing in terms of ease of construction, thermal efficiency, durability, and weather resistance. The insulation should drape over the ground at the bottom of the pile by at least six inches, and should not fall short of the ground leaving and uninsulated space for heat to escape. Care should be taken not to damage the insulation during installation or removal. The insulation is planned for reuse on subsequent piles. Insulation should be stockpiled under tarpaulins when not in use for weather protection. Multiple layers of insulation may be used in some tests, where the insulation layers will be staggered such that seams between underlying rolls are covered by overlying rolls.

**Top layer -** Wire mesh (non-galvanized carbon steel wire mesh) shall be used to hold the insulation layer in place due to wind and weather. The wire mesh shall be pinned to the ground to secure the insulating system in place. Landscape spikes shall be used to anchor the pile to the ground at one-foot interval. Extra care should be taken to insure that the insulation is properly anchored, particularly in the half of the pile closest to the burner, to prevent heat from escaping.
A. The burner system shall be a skid-mounted assembly complete with combustion air fan, control panel, and burner shroud to direct the heat into the pile. The burner skid shall be placed adjacent to the pile but not directly contacting the pile (or in the pile). Hot burner gas will be directed into the pile through the shroud.

B. The burner exit shall not be blocked with large items or plate that would restrict or inhibit airflow. No range scrap should be placed directly contacting the burner flame. The burner flame length is estimated to be 3 to 3.5 feet at full throttle.

B. High temperature thermal fabric (supported by stainless steel welded wire mesh) shall be draped around the burner shroud and onto the scrap pile to provide a seal around burner interface with the scrap pile. The burner interface shall be configured such that the burner flame is not permitted to contact the scrap in the pile.

3.7 SUPPORT FACILITIES

A. One local burner control panel (located on the burner skid) and a remote Operator Workstation (OW) shall be provided. The OW shall be housed in a shelter provided by ATC located at or outside the perimeter of the radius of safety. The shelter shall be provided with electric power (120 VAC), and heating and cooling to accommodate the OW and operator. The HGD system will be operated from the OW after the burner is turned on.

B. Temporary propane storage tanks shall be located at approximately 100 feet of the pile (and burner) and may be armor shielded as determined by the Installation Safety Branch. A 1000-gallon propane tanks shall be furnished. Propane from the tanks shall be supplied to the burner in a temporary configuration using aboveground flexible hose as described in the specifications.

C. Provided that line power is not available, an engine-generator set with fuel tank shall be located in the vicinity of the propane storage tank (at approximately 100 feet from the pile and burner skid). The electric generator provides electric power to the burner skid using temporary aboveground power cable. The generator should be trailer or skid mounted, and include integral diesel fuel tank. The engine-generator set may be armor shielded as determined by the Installation Safety Branch. A ground rod will be driven in the vicinity of the generator and connected to the generator.

D. Temporary lighting at the sites, support sites, and the OW should be provided.
APPENDIX C

MATERIALS SAFETY DATA SHEETS
MAY BE USED TO COMPLY WITH OSHA'S
HAZARD COMMUNICATION STANDARD.
29 CFR 1910.1200. STANDARD MUST BE
CONSULTED FOR SPECIFIC REQUIREMENTS.

MATERIAL SAFETY DATA SHEET - NON-MANDATORY FORM
IDENTITY: - SILMAT NEEDLED INSULATION

SECTION 1
Manufacturers Name: Ametek, Inc.
Chemical Products Division
Address: 900 Greenbank Road
Wilmington, Delaware 19808

Emergency Telephone Number: (302) 995-0496
Information Telephone Number: (302) 995-0400
Date Prepared: May 1999

SECTION 2 - HAZARDOUS INGREDIENTS INFORMATION
Hazardous Components: OSHA PEL: ACGIH TLV: R (OPTIONAL)
Amorphous Silica (CAS #7631-86-9) • 10mg/m³ 96

*OSHA has not established a specific PEL for fibrous silicon dioxide materials such as Siltemp. Chemically Siltemp is amorphous silica which has an OSHA limit of 80mg/m³.

SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS
Boiling Point: N/A Specific Gravity: 2.2
Vapor Pressure: N/A Melting Point: >3,000°F
Vapor Density: N/A Evaporation Rate: N/A
Solubility in Water: Not Soluble
Appearance and Odor: White, No Odor.

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

Flammable Limits: LEL: N/A UBLL N/A

Extinguishing Media: Water, foam, carbon dioxide, or dry chemical as suitable for type of surrounding fire.

Special Fire Fighting Procedures: Use self-contained breathing apparatus in a sustained fire.

Unusual Fire and Explosion Hazards: None known

SECTION 5 - REACTIVITY DATA

Stability: Unstable

X Stable

Incompatibility (Materials to Avoid): Basic phosphates, hydrofluoric acid and some oxides and hydroxides

Hazardous Decomposition or By-Products: None known. Material contains no organic coatings that would oxidize during decomposition.

Hazardous Polymerization: May Occur

May Not Occur X

SECTION 6 - HEALTH HAZARD DATA

Routes of Entry: Inhalation X Skin X Eyes X Ingestion Not likely to occur

HEALTH HAZARDS

ACUTE

Ingestion: Not a normal route of exposure. May cause temporary irritation of digestive tract. If symptoms develop, contact a physician.

Skin Contact: May produce temporary irritation of skin when coming in contact with skin.

- 2 -
Eye Contact: Fibers and dusts may cause temporary irritation to the eyes.

Inhalation: Inhalation of fibers may cause irritation to the mouth, nose, and throat.

Chronic: There are no known health effects associated with chronic exposure to this product.

Carcinogenicity:

Hazardous Ingredients:

<table>
<thead>
<tr>
<th>Listed as carcinogen by:</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous Silica</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Signs and Symptoms of Exposure:

Eye, skin, throat, and nose irritation may occur.

Medical Conditions Aggravated by Exposure:

Persons with pre-existing skin and respiratory disorders may be more susceptible to the effects of exposure to this material.

Emergency First Aid Procedures:

Inhalation: Seek medical attention for digestive tract symptoms.

Skin Contact: Wash contacted area of skin thoroughly with mild soap and cool water. Using a skin cream after washing may reduce irritation. Seek medical attention if irritation persists.

Eye Contact: Flush eyes immediately with running water for at least 15 minutes. Seek medical attention if irritation persists.

Inhalation: Remove person from source of exposure. Seek medical attention if irritation persists.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spill or Leak Procedure: N/A

Waste Disposal Method:
The transportation, storage, treatment, and disposal of this waste material must be performed in compliance with all applicable Federal, State, and local regulations.

Precautions to be Taken in Handling and Storing:
Store in a clean, dry place and keep containers closed. Material which has been subjected to elevated temperatures (>1900°F) may undergo partial conversion to cristobalite, a form of crystalline silica, which
may cause respiratory illness. The amount of cristobalite present will depend on the temperature and length of service. The OSHA permissible exposure limit (PEL) for cristobalite is 0.05 mg/m³ (resp.).

Particular care should be taken when working with "used" material to minimize dust. If exposure limits are exceeded or if irritation is experienced, NIOSH approved respiratory protection should be worn.

SECTION 8 - CONTROL MEASURES

Respiratory Protection:
Use a NIOSH approved disposable dust respirator such as 3M Model 6710 or equivalent when high dust levels are present or the level of fibers exceeds the OSHA permissible exposure limits.

Ventilation:
General ventilation and/or local exhaust ventilation should be utilized to maintain exposures below the PEL's or TLV's. When material is used at elevated temperatures, adequate ventilation must be available.

Eye Protection:
Safety glasses with side shields or chemical splash goggles must be worn to prevent eye contact. A safety eyewash station should be readily available near the work area.

Protective Clothing:
Wear rubber gloves when handling the product. Personnel that are more susceptible to irritation from fibers or dusts should wear full-body coveralls.

Work/Hygiene Practices:
Use good personal hygiene. Use of protective creams before handling the material may prove beneficial.

We cannot anticipate all conditions under which this information and our products, or the products of other manufacturers in combination with our products, may be used. Users are advised to make their own tests to determine the safety and suitability of each such product or product combination for their own purposes.
**SECTION 2 - HAZARDOUS INGREDIENTS**

<table>
<thead>
<tr>
<th>CHEMICAL OR COMMON NAME</th>
<th>MAX. % BY WEIGHT</th>
<th>UN#</th>
<th>CAS#</th>
<th>TLV (SOURCE)</th>
<th>PEL (SOURCE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrous glass</td>
<td>98.7</td>
<td>not</td>
<td>not</td>
<td>not listed</td>
<td>not listed</td>
</tr>
<tr>
<td>(textile grade)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibrous glass dust</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>5mg/m³ (ACGIH) (inhalable)</td>
<td>5 mg/m³ (OSHA) (respirable)</td>
</tr>
<tr>
<td>(known*)</td>
<td>assigned</td>
<td>assigned</td>
<td>assigned</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*AMOUNT WILL BE DEPENDENT UPON METHOD OF HANDLING*

**SECTION 3 - OTHER INGREDIENTS**

ITEMS LISTED IN THIS SECTION ARE EITHER CHEMICALLY OR PHYSICALLY BONDED TO THE FIBROUS GLASS TEXTILE AND ARE DEEMED NON-HAZARDOUS IN THE STATE SUPPLIED.

<table>
<thead>
<tr>
<th>CHEMICAL AND COMMON NAME</th>
<th>MAX. % BY WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starches, PVA, lubricants, surfactants, and humectants. (i.e. normal textile sizing)</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**SECTION 4 - PHYSICAL DATA**

- Specific Gravity: Approx. 2.5
- APPEARANCE/PHYSICAL STATE: White; solid
- ODOR: No distinctive odor
- SOLUBILITY IN WATER: Negligible
SECTION 5 - FIRE HAZARD DATA

FLASH POINT: Not applicable  
FLAMMABLE LIMITS: Not applicable  
EXTINGUISHING MEDIA: Water, dry powder, or foam (needed for packaging only).  
SPECIAL FIRE FIGHTING PROCEDURE: In any sustained fire, wear self-contained breathing apparatus.  
UNUSUAL FIRE HAZARDS: In a sustained fire, combustible decomposition products may be released. These products include carbon dioxide, carbon monoxide and low molecular weight hydrocarbons.

SECTION 6 - REACTIVITY DATA

STABILITY: Stable  
HAZARDOUS POLYMERIZATION: Will not occur  
CONDITIONS/MATERIALS TO AVOID: None Known  
HAZARDOUS DECOMPOSITION PRODUCTS: None generated under normal storage or handling conditions.

SECTION 7 - HEALTH HAZARD DATA

POTENTIAL ROUTES OF ENTRY: Inhalation, skin contact  
EFFECTS OF OVEREXPOSURE: Direct skin contact with fibrous glass or its dust may cause mechanical irritation and transient dermatitis. Breathing of fibers or dust may cause mechanical irritation of the mouth, nose, and throat.  
EMERGENCY AND FIRST AID PROCEDURE:  
Inhalation: Move to fresh air area.  
Ingestion: Not likely to occur through normal use, should ingestion occur seek medical attention.  
Eyes: Flush with flowing water for 15 minutes - seek medical attention  
Skin: Flush with ample cool water followed by washing with mild soap to remove accumulated fibers.  
CARCINOGEN: Not classified as regulated under ACGIH, IARC, NTP, or OSHA. Industry studies have shown textile grade fibrous glass to be a non-carcinogen.

SECTION 8 - SPECIAL PROTECTION REQUIRED

Exposure to fibrous glass may cause mechanical irritation to the skin, eyes, nose and throat. Typically such irritation occurs to newly exposed individuals, and usually diminishes after several days of exposure.  
RESPIRATORY: If airborne fibrous glass exceeds the regulatory limits, or if upper respiratory irritation occurs, use a respirator designed for nuisance type dust.  
VENTILATION: Normal area ventilation is sufficient in most cases to keep dust and fiber levels below the TLV or PEL.  
SKIN: Barrier creams, gloves, and long sleeve loose fitting clothing may be required for certain workers who have sensitive skin or contact dermatitis. Work clothing should be laundered separately from other clothing before reuse.  
EYE: Not normally required, but as a good safety work practice, suggest the wearing of appropriate eye protection such as safety glasses/side shields or equivalent whenever use of the product releases airborne fibrous glass.  
OTHER: Observe good personal hygiene.
SECTION 9 - CONTAINMENT AND DISPOSAL

CONTAINMENT AND CLEAN UP: Dust or loose fibers can be vacuumed or swept with the aid of a dust suppressant.
DISPOSAL: Dispose according to local, state, and federal laws. This material is not regulated under RCRA hazardous waste regulations.

SECTION 10 - SPECIAL PRECAUTIONS

SHIPPING: Not regulated by DOT; not classified by TDG
STORAGE: Store in dry area.

SECTION 11 - REGULATORY INFORMATION

CERCLA: Not listed
SARA TITLE III: Exempt by definition
PA RIGHT-TO-KNOW: Less than reportable quantity
TSCA INVENTORY: Exempt per section 8(a), 710.2(f), and 794 5(a)

CA PROPOSITION 65: Insignificant trace quantity
MA RIGHT-TO-KNOW: Less than reportable quantity
NJ RIGHT-TO-KNOW: Less than reportable quantity

Revision Date: January 2, 2002
Prepared By: Jacen Busick
Technical/Emergency Information: (336) 545-6011
Title: Chemist
APPENDIX D
HEALTH AND SAFETY PLAN

1.0 PURPOSE

To establish safe operating procedures and to assign responsibilities for decontamination of potential explosively contaminated metallic range scrap utilizing a transportable Hot Gas Decontamination (HGD) process in compliance with Department of Defense (DoD) DIRECTIVE NUMBER 4715.11, Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges Within the United States, 17 August 1999.

2.0 APPLICABILITY

This SOP applies to the HGD process IAW DoD Directive Number 4715.11 of ensuring the long term viability of DoD ranges while protecting human health and the environment while promoting resource recovery and recycling. In the to the HGD process, the potential explosively contaminated metallic range scrap is heated-up to 600°F for up to 6 hours or until all of the explosives are eliminated.

3.0 RESPONSIBILITY

a. Each individual is responsible for personal compliance with the provisions of this SOP to the degree and extent covered by his individual duty assignments.

b. The Project Manager or Health and Safety Officer is responsible for:

(1) Maintaining a thorough knowledge of Range Operations Regulations which are applicable to the range area being used.
(2) Providing technical information for determining danger zones and requirements for adequate protective equipment and personnel shelters.
(3) Establishing and maintaining, at the range site and within the danger area, the minimum number of operating and transient personnel required to operate safely and efficiently.
(4) Ensuring that the quantity of potential explosively contaminated metallic scrap at the site does not exceed the minimum amount required to conduct the operations safely and efficiently.
(5) Ensuring that all personnel are briefed daily prior to operations and are fully cognizant of their respective duties.
(6) Ensuring that all personnel, visitors, and transient personnel wear the appropriate personal protective equipment.
(7) Halting operations when unsafe/hazardous conditions are discovered.
(8) Ensuring that all non-essential transients and visitors remain a safe distance from the site during setup and execution.
(9) Ensuring that all operating personnel are under cover in an approved shelter during execution.
(10) Ensuring all support groups associated with the operations thorough clean-up of their responsible areas at completion.
(11) Briefing all personnel in regard to range control procedures.

(12) Ensure that the propane tank, the generator and the toxic fumes generator are properly shielded.

(13) Ensure that the generator and the propane tanks are operated and maintained by trained and certified personnel.

c. The Operator(s) are responsible for:

(1) For proper placement and handling of potential explosively contaminated metallic range scrap at the site.

(2) Properly disposing of all suspect and unexploded ordnance before conduct of operations.

d. Health and Safety Officer is responsible for:

(1) Determining and plotting danger zones.

(2) Inspecting all initial range setups and periodically re-inspecting thereafter as necessary.

(3) Granting personnel clearances for all movement in the danger areas and granting firing clearances for firing programs/operations.

(4) Halting operations in emergencies.

(5) Informing operators of unfavorable weather warnings.

(6) Informing transients and visitors to the site during periods about actions to be taken.

e. Immediate supervisors are responsible for providing and documenting training during continuous operations under this SOP for supervised personnel involved in these operations.

f. Equipment Operators are responsible for:

(1) Ensuring that the proper MHE is used during the formation and teardown of the scrap piles and the moving of the equipment.

(2) Ensuring that the MHE is in good working condition.

4.0 PERSONNEL LIMITS

a. Operating personnel are restricted to the minimum number required to conduct operations in a safe and efficient manner.

b. Only observers and transient personnel with an official interest will be permitted at the site. Transient personnel will not participate in any part of the operation.

c. The total number of personnel at the site during the HGD process (heat-up through cool down) will not exceed the approved capacity of the instrumentation building or trailer.

5.0 SAFETY REQUIREMENTS

a. Industrial:

(1) All personnel (including all transients and visitors) will wear appropriate safety shoes at all times.
(2) Personnel engaged in operations creating hand hazards will wear leather gloves.
(3) Personnel engaged in operations near the generator while it is running will wear appropriate hearing protection.
(4) Personnel engaged in installation and removal of the thermal blankets will wear appropriate personnel protection equipment (PPE). Specifics PPE will be determined by the Health and Safety Officer, once the MSDS’s for the thermal blankets are received.
(5) At least two 10-lb class ABC fire extinguishers will be readily available to combat incipient fires.

b. Explosives:
(1) Carrying flame-producing devices at the site is prohibited. Smoking is restricted to approved designated areas.
(2) Handling and emplacing spiked coupons (if appropriate) will be performed by an operator.
(3) When handling spiked coupons contaminated with explosives, rubber or latex disposable gloves will be worn.
(4) Any remaining unexploded ordnance will be removed.

c. Range:
(1) Personnel must obtain personnel clearances from the appropriate range control operator before entering range areas and cancel clearances upon leaving.
(2) Personnel in the danger zone will be under cover in an approved bombproof or shelter and in direct communication.
(3) Road guards, flashing red warning lights, and/or barricades will be posted as required by the Project Health and Safety Officer.

d. Environmental:
(1) In the case of a spill inside of a building, the following steps should be taken:
   (a) If the spilled item is hazardous to health:
      1. Leave the spill area.
      2. Dial 911 and the installation Environmental Team.
      3. Seek medical attention, if necessary.
   (b) If the spilled item is non-hazardous to health:
      1. Contain the spill.
      2. Clean up spill using proper absorbents and contact the installation Environmental Team for disposal.
      3. If too large to contain, dial 911 and the installation Environmental Team.
(2) In the case of a spill outside of a building, the following steps should be taken:
(a) Dial 911 and the installation Environmental Office.

(b) Small Spill (able to contain)
   1. If non-hazardous, clean up using proper absorbents.
   2. Contact the installation Environmental Office for disposal.

(c) Large Spill (unable to contain).
   1. Secure the area.
   2. Remain on-site until emergency personnel arrive.

e. Accident Reporting:
   (1) Take care of personnel injury first.
   (2) Dial "911" for ambulance or other emergency assistance when needed.
   (3) Notify the immediate supervisor, the range control operator, and the installation Safety Office as soon as possible.
   (4) Follow accident reporting procedures.

6.0 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

Safety glasses.
Spark-proof or electrical hazard safety shoes.
Gloves.
Ear plugs/muffs.
Coveralls (for handling thermal blankets).
Respirator (for handling thermal blankets).
Tyvek suits (possibly for handling thermal blankets).

7.0 BARRICADES AND/OR OPERATIONAL SHIELDS

Bombproofs, shelter, shields, warning signs, and related equipment.

8.0 FIRST-AID EQUIPMENT

One standard first-aid kit will be on hand at remote locations.

9.0 FIRE-FIGHTING EQUIPMENT

Two 10-lb class ABC fire extinguishers will be provided by crew personnel or supervisor of the firing location.

10.0 OPERATING EQUIPMENT

a. Propane Tank for burner.

b. Generator with auxiliary diesel fuel tank.

c. One 2.5 million BTU/hour propane burner with controls.

d. Surveillance cameras to monitor operations from a safe distance.
e. Lights to monitor operations after dark.

11.0 EXPLOSIVES

Potential explosively contaminated metallic range scrap and spiked coupons.

12.0 PROCEDURES

The Health and Safety Officer will give a daily safety briefing.

After ensuring power and fuel to the propane heater are disconnected, the operator and crew with appropriate MHE will form an 8' high by 18’ diameter circle of potential explosively contaminated metallic range scrap.

Instrumentation personnel will mount thermocouples, as required, on and in the range scrap and perform a continuity check.

A layer of fencing wire, two to three layers of thermal blankets and a layer of chicken wire will be placed over the pile of scrap. The layers of wire will be secured to the ground with spikes.

A hole will be cut into the covering and install propane heater.

The propane lines will be attached to the burner.

A platform will be placed over the pile to accommodate emissions monitors. The emissions monitors will be carefully placed on the platform and around the pile using ground guides and a crane.

The burner will be connected to diesel powered electrical generator and the generator will be started. Make sure that the auxiliary fuel tank is full.

The cameras and lights will be turned on.

All required personnel will retire to the instrumentation trailer and all vehicles and equipment will be moved to a safe location. Prior to startup, the operator will verify that all personnel are under cover.

The burner will be remote started.

Once the last thermocouple was reached a temperature 120°F or less, the blanket will be removed and the pile will be reused or torn down in the reverse order of this procedure.

13.0 ELECTRICAL STORMS

a. Operators will halt all explosive handling during the period of lightning threat. All personnel will retire to an approved shelter/building when notified. Heating and cooling of the scrap material will not be stopped during electrical storms.

b. Operations can resume after the specified time frame has passed.

c. The person in charge of operations must use good judgment and determine when to halt and when to resume operations.

14.0 POSTING

A copy of this HASP and applicable changes or supplements will be posted at the site of the operation.
<table>
<thead>
<tr>
<th>JOB HAZARD ANALYSIS</th>
<th>JOB TITLE/OPERATION: HOT GAS DECONTAMINATION TECHNOLOGY DEMONSTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASIC JOB STEPS</strong></td>
<td><strong>EXISTING/POTENTIAL HAZARD</strong></td>
</tr>
<tr>
<td>1. Daily safety briefing</td>
<td></td>
</tr>
<tr>
<td>2. Formation of the scrap piles</td>
<td>2a. Heavy moving materials</td>
</tr>
<tr>
<td></td>
<td>2b. Cuts &amp; abrasions on all body parts</td>
</tr>
<tr>
<td>3. Placement of Spiked Coupons &amp; Thermocouples with Continuity Check</td>
<td>3a. Heavy moving materials</td>
</tr>
<tr>
<td></td>
<td>3b. Cuts &amp; abrasions on all body parts</td>
</tr>
<tr>
<td></td>
<td>3c. Explosion Hazard (coupons)</td>
</tr>
<tr>
<td>4. Cover Pile with fence wire, thermal blankets and chicken wire</td>
<td>4a. Heavy moving materials</td>
</tr>
<tr>
<td></td>
<td>4b. Cuts &amp; abrasions on all body parts</td>
</tr>
<tr>
<td></td>
<td>4c. Skin irritation</td>
</tr>
<tr>
<td></td>
<td>4d. Inhalation</td>
</tr>
<tr>
<td>5. Cut hole through pile covering and install propane heater</td>
<td>5a. Heavy moving materials</td>
</tr>
<tr>
<td></td>
<td>5b. Cuts &amp; abrasions on all body parts</td>
</tr>
<tr>
<td></td>
<td>5c. Skin Irritation</td>
</tr>
<tr>
<td>6. Attach Propane Lines to the Burner</td>
<td>6. Burn, flash fire</td>
</tr>
<tr>
<td>7. Set-up Emissions Monitors (Around and over pile)</td>
<td>7a. Slips, trips, and falls</td>
</tr>
<tr>
<td></td>
<td>7b. Back sprains &amp; crushed extremities</td>
</tr>
</tbody>
</table>
## JOB HAZARD ANALYSIS (Continued)

<table>
<thead>
<tr>
<th>BASIC JOB STEPS</th>
<th>EXISTING/POTENTIAL HAZARD</th>
<th>RISK</th>
<th>CORRECTIVE MEASURES</th>
<th>RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Connect Burner to Diesel Powered Electrical Generator</td>
<td>8. Electrocution</td>
<td>ID</td>
<td>8. Have generator grounded, turned off and connected by a trained and certified operator</td>
<td>IE</td>
</tr>
<tr>
<td>10. Turn-on cameras and Lights</td>
<td>10. Loss of data</td>
<td>IVD</td>
<td>10. Shut-down burner, troubleshoot, take appropriate action</td>
<td>IVE</td>
</tr>
<tr>
<td>11. All personnel leave, TD lock the gate and move to instrumentation trailer</td>
<td>11. Someone left behind</td>
<td>ID</td>
<td>11. Personnel count and check area with cameras</td>
<td>IE</td>
</tr>
<tr>
<td>12. Remote start burner</td>
<td>12a. Personnel injured, equipment damaged</td>
<td>ID</td>
<td>12a. Limit the number of people in the area</td>
<td>IIE</td>
</tr>
<tr>
<td></td>
<td>12b. Burner doesn’t start</td>
<td>IID</td>
<td>12b. Troubleshoot w/ minimum number of people</td>
<td>IIE</td>
</tr>
<tr>
<td></td>
<td>12c. Environmental damage</td>
<td>IID</td>
<td>12c. Use fire breaks and take soil samples</td>
<td>IIIE</td>
</tr>
<tr>
<td>15. Disconnect propane lines</td>
<td>15. See step 6</td>
<td></td>
<td>15. See step 6</td>
<td></td>
</tr>
<tr>
<td>17. Remove blankets</td>
<td>17. See step 4</td>
<td></td>
<td>17. See step 4</td>
<td></td>
</tr>
<tr>
<td>18. Remove thermocouples and spiked coupons</td>
<td>18. See step 3</td>
<td></td>
<td>18. See step 3</td>
<td></td>
</tr>
</tbody>
</table>