Baffinland Iron Mines Corporation

WASTE MANAGEMENT PLAN

BAF-PH1-830-P16-0028

Rev 3

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TRACK CHANGES TABLE

A review and update of the Waste Management has been undertaken, with the following salient revisions to the March 26, 2014 version (BAF-PH1-830-P16-0028, r2).

Index of Major Changes/Modifications in Revision 3, March 2015:

Item No.	Description of Change	Relevant Section
1	Updated introduction to consider 2015 Work Plan	Section 1.1
2	Updated Table 4-2: Waste Handling and Disposal by Waste Type	Section 4.2
3	Removed Table 4-3: Non-Hazardous Solid Waste Generation Estimate	Section 4.2
4	Updated Table 4-4: Estimated Domestic Non Hazardous Waste Generation	Section 4.2
5	Removed Table 4-5: Estimated Hazardous Waste Generation	Section 4.2
6	Updated and renamed Section 4.3.4: Waste Management Facilities	Section 4.3.4
7	Updated Table 4-6: Mary River Project Waste Management Facility Summary	Section 4.3.4
8	Added Open Burning Section	Section 4.6
9	Updated Landfill Section	Section 4.7
10	Updated section on landfarm	Section 4.9
11	Added Dredging Waste Section	Section 4.14
12	Updated On-Site Environmental Team Responsibilities Table	Section 5.1
13	Updated Mary River Organizational Chart	Section 5.1
14	Updated Monitoring and Reporting requirements Section	Section 7
11	Updated references	Section 10
12	Updated Incinerator Maintenance and Operation Manual	Appendix D
13	Removed Landfarm appendix (transferred to Hazardous Materials and Hazardous Waste Management Plan)	Appendix E
14	Updated Waste Sorting Guidelines	Appendix E
15	Included 2015 Work Plan	Appendix F
16	Updated Site Layout drawings	Appendix F
17	Updated Open Burning procedure	Appendix H
18	Removed Appendix relating to Steensby and Rail Camps	Appendix J and K

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Abbreviations

Baffinland:	Baffinland Iron Mines Corporation
CCME:	Canadian Council of Ministers of the Environment
EHS:	Environmental, Health and Safety
EIS:	Environmental impact statement
EPCM:	Engineering, Procurement, and Construction Management
EPP:	Environmental Protection Plan
ERCB:	Energy Resources Conservation Board
GN:	Government of Nunavut
HHW	Household Hazardous Waste (e.g. batteries, lamp bulbs, aerosol cans)
HSE:	Health, Safety and Environment
IIBA:	Inuit Impacts Benefits Agreement
MSC	Mine Site Complex (Mary River Camp)
NIRB:	Nunavut Impact Review Board
NWB:	Nunavut Water Board
NU:	Nunavut
NWT:	Northwest Territories
the Project:	Mary River Project
PSC	Port Site Complex (Milne Inlet)
QIA:	Qikiqtani Inuit Association
TDG:	Transportation of Dangerous Goods
VEC:	Valued Ecosystem Components
WMP:	Waste Management Plan

1 INTRODUCTION

Baffinland Iron Mines Corporation is committed to taking the necessary steps to ensure that the collection, handling, storage, transportation and disposal of wastes generated during the construction, operation and closure of the Mary River Project (the Project) is conducted in a safe, efficient and environmentally compliant manner. The preparation of the Waste Management Plan (WMP) for the construction, operation and closure phase of the Project helps to achieve this goal. The WMP establishes the roles and responsibilities of employees, contractors and other site personnel as well as protocols for handling, storing and disposing of all solid wastes generated at the Project site. The intent is to afford a high degree of control over the waste generation while minimizing the adverse environmental effects associated with waste generation.

The basis of a sound waste management program lies in the three R's: reduction, recovery, reuse and recycling of wastes. The main objectives of this WMP are to:

- Create a framework for the proper handling and disposal of wastes.
- Minimize the potential for adverse impacts on the environment.
- Achieve compliance with waste management regulatory requirements.

Waste generation follows the "Cradle to Grave" principle. It is the primary responsibility of all personnel to implement the plan as outlined, in accordance with their contractual and legal obligations, under the supervision of the Operations Manager and Site Services Manager, as assisted by the Environmental Manager and his/her team.

This plan will be reviewed on an annual basis and updated as necessary to accommodate any identified gaps or opportunities to improve.

1.1 2015 WORK PLAN UPDATE

A 2015 Work Plan was submitted to the Nunavut Water Board and other agencies on October 31, 2014. On December 12, 2014 Baffinland submitted the 2015 Work Plan Addendum ('Addendum') which was an update to the 2015 Work Plan submitted on October 31, 2014 (see Appendix F). The purpose of this Addendum was to include additional work scope for 2015 that was not captured in the October 31, 2014 submission. Works and activities proposed have been screened by the NIRB, unless noted otherwise, and have been considered in the Project Certificate No. 005 issued by the NIRB on December 28, 2012.

Continued development and construction of infrastructure in 2015 includes:

- If required, compaction and removal of material from the ocean bottom near the ore dock to maintain the required vessel draft depths. Suitable removed material will be used as backfill within the ore dock structure.
- Install an additional hazardous waste containment cell at Milne Port.

- Construct hazardous waste and fuel containment berms at the Mine Site.
- Extend the Mine Site landfill to increase capacity based on the approved design area.

In addition, progressive reclamation plans for 2015 include the follow activities:

- Ongoing long term management of calcium chloride salt storage and use at the Project Site. This includes waste segregation of salt bags and proper disposal of collected materials as well as identifying and containing compromised salt packages to prevent materials being distributed around the site.
- Ongoing testing, managing, and disposal of the historical inventory of incinerator bottom ash at the Mary River Mine Site and Milne Port.
- Completion of the decommissioning of the historical bladder farm at Milne Port. Work includes management of hydrocarbon impacted soils within the existing landfarm facility.
- Continuation of the decommissioning activities the existing bladder farm at the Mary River Mine Site. Work includes the treatment of oily water contact water and the management/storage of hydrocarbon impacted soils prior to placement in a landfarm facility. Consideration will be given to designing and constructing a new landfarm at the Mary River Mine Site during 2015, located adjacent to the existing landfill area.
- Demobilization of equipment and supplies not required for near term activities, as well as the current inventory of hazardous waste and other materials by means of sealift from Milne Port Site.
- Continued development of the Mine Site landfill and deposition of non-hazardous wastes in accordance with the Landfill Maintenance and Operations Manual. Consideration will be given to designing and constructing a new landfill at the Milne Port Site if it is deemed necessary during 2015. Note that this activity would require application and approval from the NWB and QIA.

In order to support these activities, Baffinland will conduct waste management activities and operate waste management infrastructure as described within this Plan. The current Type A Water Licence (2AM-MRY1325) and Type B Water Licence (2BB-MRY1416) authorize Baffinland to perform and operate said activities and infrastructure, respectively, in accordance with the Nunavut Water Board conditions as described in the respective licences.

The WMP is an update to the existing plan and supersedes the BAF-PH1-830-P16-0028, Revision 2, dated March 26 2014. The waste management infrastructure at Milne Port and Mine Site project sites will continue to be used as approved and designed. For 2015, this plan will be applied as appropriate to all project sites applicable under the existing Type B and Type "A" Water Licences including Milne Port, the Mary River Mine Site, and any authorized exploration camps.

1.2 PURPOSE

A key aim of the WMP is to implement a sound waste minimization program that will focus upon the principles of Reduction/Recovery/Reuse/Recycling. The residual waste generated by the Project activities

will then be disposed of in a landfill/landfarm (or other authorized location), incinerated, or shipped off site to southern Canada for final disposal, treatment, or recycling.

This WMP deals with wastes generated by the Mary River Project including, among others, inert and non-hazardous solid wastes, construction debris, and domestic waste. The management of sewage effluent and sludge from the sewage treatment plants is the subject of the Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010). The management of hazardous wastes (e.g. used oils, contaminated fuel and antifreeze, used chemical products, biomedical waste and spills clean-up materials) is the subject of the Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

The WMP presents the various disposal methods, the types and expected quantities of waste produced and the ultimate disposal of the waste stream. The Plan also defines the roles and responsibilities, specific requirements, and monitoring controls for managing solid wastes generated by the Project. It also presents the strategy for adaptive management and continuous improvement.

In order to handle, store, transport and treat/dispose the wastes generated during the construction, operation and closure phases of the Project, several treatment or disposal facilities have been built on site to ensure that the waste management activities are being conducted in a safe, efficient and environmentally -compliant manner:

- Waste management facilities including incinerators at the Mine Site and Port Site.
- Landfill at the Mine Site.
- Landfarm at Milne Port.

All Project activities are regulated and will be performed according to the law and regulations applicable to the Project and procedures developed.

The WMP presented in this document establishes a management strategy for all the wastes generated during the construction, operation, closure and reclamation of the Project.

1.3 DEFINITIONS

Project: The necessary tasks and work executed during the lifespan of the Project at the Project Site, including the construction, operation, closure and reclamation phases, of the Project.

Site: The areas occupied by the Project facilities (permanent or temporary) during the construction, operation, closure and reclamation phases of the Project.

Contractor: A person or business which provides goods, material, equipment, personnel, and/or services to Baffinland Iron Mines Corporation under terms specified in a contract.

Waste:	The residual waste material (hazardous, non-hazardous or Putrescible) generated during the construction, operation, closure and reclamation phases of the Project.
Hazardous Waste:	The wastes generated during the lifespan of the Project that present a threat to the human health or the environment because they exhibit one or more of the following characteristics: corrosive, reactive, explosive, toxic, inflammable, or biologically infectious.
Non-Hazardous Waste:	The wastes generated during the lifespan of the Project that do not present a threat to human health or the environment.
Putrescible Wastes:	The wastes generated during the lifespan of the Project that degrade very rapidly, i.e., plants, food scraps or animal remains.
Incinerator Wastes:	Waste identified as suitable for incineration based on incineration technology used on-site, applicable regulations and project approvals. Includes: food waste, domestic waste, packaging waste, wood waste, absorbents, and some types of filters (e.g., air filters)
Clean Wood Products:	Clean untreated wood waste including wood or timber, not suitable for recycling or reuse, which is substantially free of glue, petroleum based materials, other chemicals, or contains other non-wood chemical products.
Opacity	Opacity is the degree to which the exhaust gases reduce the transmission of light and obscure the view of any object in the background. It is expressed as a percentage representing the extent to which an object viewed through the gases is obscured. Although not an emission standard, opacity provides an indication of the general performance of the incinerator during normal operation.

1.4 Regulatory Requirements

A number of Acts and Regulations provide specific requirements for the management of non-hazardous solid waste generated at the Mary River Project. They are the:

- Territorial Lands Act 1985
- Territorial Land Use Regulations
- Nunavut Waters and Nunavut Surface Rights Tribunal Act 2002
- Canadian Environmental Protection Act
- Safety Act, Occupational Health and Safety Regulations
- National Fire Code
- Public Health Act

- Fisheries Act

Due to the complexities and the number of acts and regulations involved, the Government of Nunavut has published a number of Guidelines to assist waste generators to effectively develop waste management plans for their specific sites. These guidelines are listed as references in Section 10.

The Project is subject to Environmental Terms and Conditions in Baffinland's Commercial Lease with the QIA (Q13C301), a Type 'A' Water Licence as well a Type 'B' Water Licence. Conditions regarding aspects of waste management as outlined in this Plan specified by the Commercial Lease Environmental Terms and Conditions (Schedule F) include:

- The Tenant shall remove all Drill Waste containing poisonous or persistent chemical additives to an approved disposal facility.
- The Tenant shall deposit all non-toxic Drill Waste into a sump or natural depression.
- The Tenant shall not allow any Drill Waste to spread to the surrounding lands or watercourses.
- The Tenant shall dispose of all combustible waste petroleum products by incineration or removal.
- The Tenant shall dispose of all toxic or persistent substances in a manner as approved in writing by the Landlord.
- The Tenant shall report spills immediately to the Landlord.
- The Tenant shall use food handling and garbage disposal procedures that do not attract wildlife.
- The Tenant shall not feed wildlife.
- The Tenant shall remove all garbage and debris, including plastics, from the land use area to a disposal site as specified in the accepted application.
- The Tenant shall keep all on-site garbage and debris in a secure container that is acceptable to an Inspector until disposed of.

Conditions regarding aspects of waste management as outlined in this Plan specified by the water licence(s) include:

- The Licencee shall prevent any chemicals, fuel or wastes associated with the undertaking from entering any Water body.
- The Licencee shall provide a section and information on the proposed land disposal of dredging waste for the purposes of construction at Milne Port Site, with information on location, amount of materials, method of disposal and any mitigation measures required for the protection of water.
- The Licencee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.

- The Licencee shall test the bottom ash generated by all Incinerator Systems, by using the acceptable test procedures for analyzing residuals, prior to being disposed of at any Landfill Facility. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the Licencee shall direct the Waste to an appropriate facility for disposal. The records of analysis results and volumes of ash shall be maintained and provided to an Inspector upon request.
- The Licencee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood, to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.
- The Licencee shall submit to the Board and the Inspector, thirty (30) days prior to the removal and transfer of waste, a declaration of authorization from any community receiving waste from the project, which clearly states that authorization has been granted for the deposit by the Licencee at the Hamlet's appropriately licenced facilities.
- The Licencee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.
- The Licencee shall remove any waste generated from temporary and permanent shelters along the tote road and along the railway corridor for treatment at appropriately licenced Waste Management Facilities.
- The Licencee shall maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records shall be made available upon request, to an Inspector or the Board.

1.5 Relationship to Other Management Plans

This plan is based on the concepts and principles found in the EHS Management System Framework Standard (BAF-PH1-830-STD-0001) and Hazard Identification and Risk Assessment Standard (BAF-PH1-830-PRO-0001). The Plan should be reviewed in concert with the following related plans that have been prepared for the FEIS and in some cases, updated in early 2014:

- Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002)
- Emergency Response Plan (BAF-PH1-830-P16-0007)
- Environmental Protection Plan (BAF-PH1-830-P16-0008)
- Explosives Management Plan (BAF-PH1-830-P16-0009)

- Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010)
- Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011)
- Interim Mine Closure and Reclamation Plan (BAF-PH1-830-P16-0012)
- Surface Water, Aquatic Ecosystems, Fish and Fish Habitat Management Plan (BAF-PH1-830-P16-0026)
- Terrestrial Environmental Management and Monitoring Plan (BAF-PH1-830-P16-0027)
- Spill Contingency Plan (BAF-PH1-830-P16-0036)
- Exploration Closure and Reclamation Plan (BAF-PH1-830-P16-0038)

1.6 2015 Work Plan Marginal Closure Cost Summary

Baffinland provides adequate resources to implement and maintain the EHS Management System including the necessary human, material and financial resources. Baffinland's Health Safety and Environment (HSE) Policy and Sustainability Policy are presented in Section 2.

1.7 Update of This Management Plan

The Waste Management Plan is a "living document". It will be regularly updated on the basis of management reviews (as outlined in Section 8), incident investigations, regulatory changes or other Project related changes.

2 BAFFINLAND POLICY

2.1 HEALTH SAFETY AND ENVIRONMENT (HSE) POLICY

Baffinland
Iron Mines Corporation

Mary River Project
Health, Safety and Environment Policy

The Baffinland Iron Mines Corporation (BIMC) Mary River Project Health, Safety and Environment Policy is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goal.

The Mary River Project implements this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance.
- Meeting or exceeding the requirements of regulations and company policies.
- Integrating sustainable development principles into our decision-making processes.
- Maintaining an effective Health, Safety and Environment Management System.
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts.
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Rehabilitation of disturbed lands to a safe, acceptable, and localized state.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution is essential and required.
- Management is responsible for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The Mary River Project has no higher priority than the health and safety of all people working on our behalf and the responsible management of the environment. In ensuring our overall profitability and business success every Baffinland and business partner employee working at one of our work sites is required to adhere to this policy.

Tom Peddon
President and Chief Executive Officer
March 2013

2.2 BAFFINLAND SUSTAINABLE DEVELOPMENT POLICY

At Baffinland Iron Mines Corporation, we are committed to conducting all aspects of our business in accordance with the principles of sustainable corporate responsibility and always with the needs of future generations in mind. Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and to create authentic relationships. We expect each and every employee, contractor, and visitor to demonstrate a personal commitment to this policy through their actions. We will communicate the Sustainable Corporate Policy to the public, all employees and contractors and it will be reviewed and revised as necessary on an annual basis.

These four pillars form the foundation of our corporate responsibility strategy:

Health and Safety
Environment
Investing in our Communities and People
Transparent Governance

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness from the very earliest of planning stages. Why? Because our people are our greatest asset. Nothing is as important as their health and safety.
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents.
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour and awareness. We allow our workers and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- We employ a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.
- We apply the principles of pollution prevention and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation.
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop pioneering new processes and more sustainable practices.
- We understand the importance of closure planning. We ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts.

3.0 INVESTING IN OUR COMMUNITIES AND PEOPLE

- We respect human rights and the dignity of others. We honour and respect the unique culture, values and traditions of the Inuit people.
- We contribute to the social, cultural and economic development of sustainable communities adjacent to our operations.
- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions.

4.0 TRANSPARENT GOVERNANCE

- We will take steps to understand, evaluate and manage risks on a continuing basis, including those that impact the environment, employees, contractors, local communities, customers and shareholders.
- We ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our environmental, safety, health, socio-economic commitments and set annual targets and objectives.
- We conduct all activities in compliance with the highest applicable legal requirements and internal standards

We strive to employ our shareholder's capital effectively and efficiently. We demonstrate honesty and integrity by applying the highest standards of ethical conduct.

Tom Paddon

President and Chief Executive Officer

September 2011

3 TARGETED VEC'S

Waste will be generated throughout the life cycle of the project. To ensure that wastes are handled, stored and managed in a safe and environmentally acceptable manner, Baffinland will apply best practices for its waste management activities.

Inadequate handling, storage and elimination of waste could impact the following valued ecosystem components (VECs):

- Soils (spills and contamination).
- Water quality (contamination of runoff).
- Fish and fish habitat.
- Permafrost.
- Vegetation (uptake of contaminants or loss of vegetation).
- Birds (exposure and ingestion of contaminants).
- Terrestrial wildlife (exposure and ingestion of contaminants).
- Human health (exposure and ingestion of contaminants).

4 WASTE MANAGEMENT APPROACH

The aim of the Waste Management Plan is to implement a sound waste minimization program that will focus upon the principles outlined in EHS Management System Framework Standard (BAF-PH1-830-STD-0001). The remaining waste will then be disposed of in a non-hazardous landfill, incinerated or shipped off-site for final disposal/treatment or recycling or disposed of by other approved and permitted means.

4.1 WASTE IDENTIFICATION

A summary of the types of waste expected to be generated by the Project, and disposal method, are presented below. For most of long the term infrastructure, the facilities used during the construction phase will be the same ones used during the operations phase.

TABLE 4-1 and TABLE 4-2 present an overview of the types of waste generated by the Mary River Project and the general disposal method for each type of waste. TABLE 4-3 presents the estimated quantities of waste generated for the 2015 Work Plan. TABLE 4-4 summarizes the Mary River Project waste management facilities.

4.2 WASTE MANAGEMENT METHODS

Wastes remaining after application of the waste minimization techniques will be managed in a practical and environmentally responsible manner utilizing methods appropriate for each waste type generated. The following methods will be applied at the site:

- Waste sorting at all generation points (see Appendix E).
- Incineration of non-hazardous combustible wastes (see Appendix C).
- Open burning in a burn box of untreated wood and cardboard (see Appendix H).
- Landfilling of inert non-combustible wastes (see Appendix D).
- Temporary storage and off-site shipping of hazardous and recyclable waste materials (see the Hazardous Materials and Hazardous Waste Management Plan, BAF-PH1-830-P16-0011).
- On-site treatment for contaminated soil from hydrocarbon spills in a landfarm (see the Hazardous Materials and Hazardous Waste Management Plan, BAF-PH1-830-P16-0011)

TABLE 4-1: DISPOSAL BY GENERATION LOCATION

Source	Waste Description	Waste Type	General Disposal Method
Offices	Computers and other electronic wastes, fluorescent lights	Recycle	Off-site recycling or disposal
	Waste paper	Combustible/ non-hazardous	Incineration
Wastewater treatment facility	Biological sludge (dried solids)	Combustible/ non-hazardous	Incineration
Maintenance complex	Used batteries, waste hydrocarbon products, engine oil, oil filters, glycols, aerosol cans, refrigerants, solvents, etc.	Hazardous	Off-site recycling or disposal, possible reuse of fuel and oil for heating and other uses.
	Scrap metal, rubber, plastic	Inert	Landfill
Laboratory	Chemical laboratory wastes, toxic substances	Hazardous	Off-site recycling or disposal
Domestic waste from construction camp, accommodation facility and kitchens/canteens	Accommodation facility garbage, food wastes	Combustible/ non-hazardous	Incineration
Inert waste from construction sites and materials from operations	Treated wood, plastics, cement, sand, used construction materials, metal, pipes, glass, insulation, etc.	Inert	Landfill
	Untreated wood/cardboard	Combustible/ non-hazardous	Incineration(Cardboard)/ open burning
Medical facility	Biomedical wastes	Hazardous	Biomedical off-site disposal
Incinerator	Ash (placed in closed drums)	Inert	Landfill (if non-hazardous)
Fuel spill	Hydrocarbon-contaminated soil	-	On-site treatment using landfarm facility
Fuel spill	Hydrocarbon-contaminated snow/water/ice	-	On-site treatment and reuse of product if practical

TABLE 4-2: WASTE HANDLING AND DISPOSAL BY WASTE TYPE

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Absorbents – and other similar spill response material	Petroleum	Hazardous if used for a spill clean-up. Not TDG regulated.	Collect in white Quatrex bags. Store full bags in the hazardous waste storage areas until final disposal.	Offsite disposal
Activated Carbon	Petroleum	Hazardous. Not TDG regulated	Collect in white Quatrex bags. Store in the hazardous waste storage areas until final disposal.	Offsite disposal
Aerosol Cans	HHW	Hazardous. TDG regulated as "Aerosol, Flammable, Class 2.1, UN 1950"	Disposal bins located at various locations inside the main facilities, and at the waste management building. Store full drums in the hazardous waste storage areas in open top drums.	Offsite disposal
Appliances	Inert/ Chemical	May be hazardous.	Appliances may contain ozone depleting substances (refrigerator) or electronic boards. Manage accordingly. Store in contained location until approval by environment office to dispose in landfill.	Landfill
Batteries, wet (lead - acid)	Chemical	Hazardous. TDG regulated as "Batteries, wet, filled with acid, class 8, UN 2794"	Collect in black Quatrex bags in workplace sorting areas. Store full bags in the hazardous waste storage areas until final disposal.	Offsite disposal
Batteries, rechargeable (NiCad, Mercury, Lithium, Silver-Oxide)	HHW	Hazardous. Small household-type batteries are generally not TDG regulated.	Disposal bins (same as for alkaline batteries) are located at various locations inside the main facilities. Segregate per type and transfer to different 20L pails. Transfer to 20L pail, then in open top drums. Store in the waste berm. Computer batteries should be brought to the Environment Office.	Offsite disposal
Batteries, dry (alkaline)	HHW	Hazardous. Not TDG regulated.	Disposal bins (same as for rechargeable batteries) are located at various locations inside the main facilities. Transfer to 20L pail, then in open top drums. Store in the hazardous waste storage areas.	Offsite disposal
Biomedical Waste – Sharps, human anatomical, blood, and body fluids	Biomedical	Biomedical hazard.	Contain and store in suitable biohazard container at the medical office until disposal.	Offsite disposal
Calcium Chloride	Chemical	Hazardous. Not TDG regulated.	Collect and store in white Quatrex bags.	Offsite disposal or use as dust suppressant on roads (as authorized)
Cardboard	Inert	Non-hazardous	Suitable for open-burning or disposal in the landfill. Store accordingly in adequate container before final disposal. Incinerate if in contact with food.	Open-burning/ Landfill

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Cement	Inert	Non-hazardous, inert waste.	May be used as a landfill cover if crushed.	Landfill
Chemicals – spent lab reagents	Chemical	Hazardous. Shipping TDG instructions should follow MSDS recommendations.	Management method should follow MSDS recommendations.	Offsite disposal
Cigarette butts	Chemical	Hazardous. Not TDG regulated.	Collect in cigarette butts receptacles outside each main entrance.	Offsite disposal/ Incineration
Compressed gas cylinders	Chemical	Hazardous. TDG regulation varies depending on gas.	Safely empty cylinders of all gases. Store away from sources of heat and ignition. Return containers to manufacturer for reuse following TDG procedures. When not shipped offsite, remove valves and purge cylinder with compressed air or inert gas. Dispose of as metal.	Offsite reuse /Landfill
Contaminated Soils	Petroleum	Hazardous. Not TDG regulated	Store and decontaminate on site in the landfarm	Onsite treatment
Contaminated snow, ice	Petroleum	Hazardous. Not TDG regulated	Store in contaminated snow dump adjacent to landfarm. Treatment in oil/water separator.	Onsite treatment
Contaminated water	Petroleum	Hazardous. Not TDG regulated	Collect in trays, drums, or pumped via pipeline. Store in closed top drums or bladders in hazardous waste storage areas until treatment in oil/water separator.	Onsite treatment
Diesel fuel	Petroleum	Hazardous. TDG regulated as “Diesel, Class 3, UN 1202, FP 39°C”	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in hazardous waste storage areas until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel. Diesel not suitable as mobile fuel can be used for heating values.	onsite recovery/ Offsite disposal
Drums – empty	Petroleum	Hazardous. Not TDG regulated	Empty drums frequently contain residuals. Drain content of drum in adequate container. Crush and package drums on pallets.	Offsite disposal
Drums – residuals	Petroleum	Hazardous. Considered the same hazard as original product.	Drum residuals are to be collected in different containers for reuse (diesel, jet A, oil) or disposal (antifreeze or other product). Reuse diesel and oil for heating and other uses.	Onsite recovery/ Offsite disposal
Electronic Equipment	HHW	Hazardous. Not TDG regulated. May contain heavy metals.	Typical electronic wastes consist of used computers, cell phones, cameras, TVs and monitor screens, media players, switches, and testing equipment. Electronic wastes shall be brought to the Environment Office. They are stored in contained location until offsite shipment for recycling. Batteries shall be removed of equipment and managed accordingly.	Offsite recycling

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Fluorescent Lamps – bulbs and tubes	HHW	Hazardous in large quantities (trace amount of mercury). Not TDG regulated.	Bulbs disposal bins are located at various locations inside the main facilities. Repack in original or reused boxes. Store tubes in recycling container. Store in designated location until offsite shipment for recycling.	Offsite disposal
Filters – Lube oil	Petroleum	Hazardous. Not TDG regulated.	Drain and crush filters. Collect in open top drums and store in the hazardous waste storage areas.	Offsite disposal
Food Waste/ Putrescible	Domestic	Non-hazardous	Collect in plastic bags. Store in lidded steel bins outside kitchen. Incinerate each or every other day.	Incineration
Gasoline	Petroleum	Hazardous. TDG regulated as "Gasoline, Class 3, UN 1203, FP -39°C"	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the hazardous waste storage areas until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel.	
Clean Glass	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill
Glycol	Chemical	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in closed top drums or 1000L tote tanks / cubes in the hazardous waste storage areas until final disposal.	Offsite disposal
Grease	Petroleum	Non-hazardous	Store in open top drums in the hazardous waste storage areas until final disposal.	Offsite disposal
Human Waste	Domestic	Hazardous. Not TDG regulated	Store in open top drums in the hazardous waste storage areas until final disposal.	Offsite disposal
Hydraulic fluid	Petroleum	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the hazardous waste storage areas until final disposal.	Offsite disposal
Incinerator Ash	Inert/ Chemical	Usually inert, if non-hazardous.	Composition of incinerator ash will depend on the wastes that were incinerated. Disposal in open top drums. Suitable for disposal in the landfill.	Landfill/ Offsite disposal (if hazardous)
Jet A Fuel	Petroleum	Hazardous. TDG regulated as "Aviation gas, UN 1863, FP 39°C"	Collect in trays, drums, or pumped via pipeline. Store in closed top drums in the hazardous waste storage areas until final disposal. Not a waste unless contaminated by a substance that makes it unusable as a fuel. Jet A not suitable as aviation fuel can be used for heating values.	Onsite recovery/ Offsite disposal
Kitchen Grease/Oil	Domestic	Non-hazardous.	Collect in closed-top drums or 20L pails in a sea container outside the kitchen. Suitable for incineration or transport to PSC a week before backhaul for final disposal.	Incineration/ Offsite disposal
Lube Oil	Petroleum	Hazardous. Not TDG regulated.	Collect in trays, drums, or pumped via pipeline. Store in 1000L tote tanks / cubes in the hazardous waste storage areas until final disposal. Possible reuse as heating oil or other uses in approved furnaces.	Onsite reuse/ Offsite disposal

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Metal	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill
Methanol	Chemical	Hazardous. TDG regulated as "Methanol, Class 3, UN 1230, P.G. II"	Collect in UN certified container. Store in the hazardous waste storage areas.	Offsite disposal
Oily rags and similar debris	Petroleum	Not hazardous if used for cleaning. Classified as Absorbent if used to clean-up spills	Suitable for incineration. Collect in drums at workplace sorting areas. Bring to incinerator and disperse between waste loads.	Incineration
Ozone Depleting Substances (ODS, i.e. air conditioning and refrigerant gases)	Chemical	Hazardous.	ODS must be removed by certified technician before disposal of unit. ODS must be stored as per instructions from certified technician.	Offsite disposal
Paint	Petroleum	May be hazardous if oil based.	Collect in white Quatrex bags. Store in the hazardous waste storage areas until final disposal.	Offsite disposal
Paper Products	Domestic	Non-hazardous	Collect in garbage bins. If product is cardboard, manage accordingly.	Incineration
Plastics – food packaging, bags, etc	Domestic	Non-hazardous	Collect in garbage bags.	Incineration
Plastics – oil/ hydrocarbon containers, contaminated berm liner	Petroleum	Hazardous. Not TDG regulated.	Drain fluid in appropriate cube or drum. Collect in white Quatrex bags. Store in the hazardous waste storage areas until final disposal.	Offsite disposal
Plastics – bulky	Inert	Non-hazardous	Collect and store clean containers or other clean component in landfill bins.	Landfill
Plastics – PVC	Inert	Non-hazardous	Collect and store in landfill bins.	Landfill
Plastics – styrofoam	Inert	Non-hazardous	Collect in white Quatrex bags. Store in landfill bins.	Landfill
Textiles	Inert	Non-hazardous	Collect and store in landfill bins. Incinerate if in contact with food.	Landfill/ Incineration
Tires	Inert	Non-hazardous	Collect and store in laydown. If shredded, tires may be useful as a landfill cover.	TBD
Unusual waste	To be determined	To be determined	Bring to the Environment Office, if size permits. Proper management and disposal will be determined on a case-by-case basis.	To be determined
Vehicles	Inert/ Petroleum/ Chemical	Non-hazardous if drained of all fluids.	Drain all fluids and dispose appropriately. Store in laydown area until approval to dispose in landfill by environment office.	Landfill
Wood - scraps	Inert	Non-hazardous, inert waste	Collect and store in landfill bins. Suitable for incineration if in small amount.	Landfill/ Incineration
Wood - treated	Inert	Non-hazardous, inert waste	Collect and store in landfill bins.	Landfill

Waste Material	Waste Type	Classification	General Management Method	Final Disposal
Wood - untreated	Inert	Non-hazardous, inert waste	Collect and store in untreated wood bin.	Open-burning

TABLE 4-3: ESTIMATED DOMESTIC SOLID NON HAZARDOUS WASTE GENERATION

Waste	Waste Description	Disposal Method	Est. Total Annual Production[1] (tonnes)
Organic	Kitchens	Incinerator	318
Paper	Packaging/Offices	Incinerator/On-site landfill	91
Plastic	Offices/Camps	Incinerator/On-site landfill	65
Cardboard	Packaging/Camps	Incinerator	69
Cloth	Camps	Incinerator	21
Multi-Material	Packaging/Camps	Incinerator/On-site landfill	15
Metal	Packaging	On-site landfill	9
Glass	Camps	On-site landfill	8
Wood	Packaging	Incinerator	6
Bottom Ash from Camp Incinerators	Historical Inventory of Ash plus ongoing generation from new camp incinerators	On-site landfill	241

NOTES
1. Composition based in part on 2011 Mary River Waste Audit results (Aug 27 - Aug 29), Assume 50% of waste generated to be domestic

4.3 WASTE FLOW

Visual representations of waste flows are presented as block flow diagrams for Milne Port and Mary River Mine Site in Appendix A. Waste streams are described and their respective storage and treatment paths are demonstrated.

4.3.1 GENERATION POINTS

Waste will be sorted and collected at all major generation points at each project site according to the Mary River Project Waste Sorting Guidelines (Appendix E). Disposal will occur in appropriately labelled receptacles based on disposal methods and waste sorting guidelines. This will ensure waste types are disposed of in the correct methods as outlined in TABLE 4-1.

All food waste will be stored in a secure facility prior to incineration to avoid the attraction of wildlife.

All wastes generated during construction, operation and closure will be managed in order to prevent any wastes entering any water body. Thus, area designated as waste disposal will be located at a minimum distance of thirty-one (31) metres from the ordinary high water mark of any water body such that the quality of water is not impaired.

4.3.2 Waste Collection

Waste will be collected from generation points regularly by a waste collection vehicle(s) and taken to the appropriate waste handling facility for treatment and/or final disposal as shown in Appendix A. Waste will be collected by personnel trained in waste handling guidelines and personnel will use visual inspection to ensure waste types are taken to the appropriate treatment or disposal location.

4.3.3 Temporary Waste Sorting and Processing Facilities (during Construction Phase only)

Temporary waste management facilities are constructed at all sites for use, especially during the construction phase. These facilities consist of a secure central depot where waste generated across the site will be managed, properly processed, packaged, labelled, inventoried, secured (e.g., on pallets) and stored for transportation to disposal site as per Block Flow Diagrams in Appendix A. All wildlife attracting wastes such as organics, sewage waste or petroleum based chemicals will be stored animal proof containers inside a secured area that will be monitored. Waste generated from the temporary and permanent shelters along the Tote Road will be stored within the shelters until it is removed to be relocated at one of the designated locations on-site.

4.3.4 Permanent Waste Sorting and Processing Facilities

Permanent waste management facilities have been constructed at the Milne Port and the Mine Site. These facilities, summarized in TABLE 4-4, consist of a heated all season building and adjacent laydown areas that provide the following capabilities, functions and/or facilities:

- A central depot where waste generated across the site will be managed, properly processed, packaged, labelled, inventoried, secured (e.g., on pallets) and stored for sealift or reuse on site.
- Incinerators (See section 4.5)
- The waste management facility has a poured concrete floor with large doors for transferring waste in and out plus an adjacent office for the waste management technician.
- Drum crushing machine (Mary River)
- Strapping and plastic wrap capabilities.

Waste oil storage tanks and burners as well as oil filters draining and crushing machine will be located directly at the main source of generation, the maintenance facility.

TABLE 4-4: MARY RIVER PROJECT WASTE MANAGEMENT FACILITIES SUMMARY

Location	Facility Type	Components	Function
Mine Site Milne Port	Waste Management Buildings	• Heated waste management building • Incinerator	A central depot where hazardous waste and waste suitable for incineration generated across the site is managed, properly processed, packaged, labeled, inventoried, and treated prior to storage.
Mine Site Milne Port	Waste Storage Areas	• Secure lined and bermed secondary containment • Used tire storage area	A central depot where hazardous waste, ash, and used tires are stored prior to final disposal off-site or on-site.
Milne Port	Landfarm	• two engineered geomembrane lined containment cells	The larger west cell is used as a landfarm for the biotreatment of contaminated soil. The smaller east cell is used for the containment of hydrocarbon contaminated snow collected during winter operations.
Mine Site	Landfill	• Licensed Landfill facility • Gated and locked area	Disposal of inert, non-combustible waste and non-hazardous wastes.
Mine Site Milne Port	Open Burn Areas	• Gated and locked area • Burn box (modified sea-can)	Disposal method for untreated wood, cardboard, and paper products generated on-site.

4.4 Waste Handling and Minimization by Category

The Waste Management Plan is designed to ensure that a sound waste management program which focuses on the principles of reduction/recovery/reuse/recycling is implemented. The following are examples of initiatives that the Mary River Project will undertake to minimize the amount of waste being generated on Project sites and ensure proper handling.

4.4.1 Grubbed Organic Soil Material

There will be a need during and at the completion of construction for re-establishment of disturbed areas. There is very little organic soil material and vegetation at the site, but what is available will be stockpiled for future use when re-establishing disturbed areas, including the temporary camp sites and laydown areas.

4.4.2 Other Spoils Removed During Excavation

Every effort will be made during the design to balance the cut and fill requirements. However most of the fill area has requirements for stability of materials that will preclude the use of some of the excavated materials. Such materials will be disposed of in a designated disposal site or used in other applications as much as possible (e.g., used for landfill cover).

4.4.3 Used Oil Re-use

Used oil will be generated across the Project from mechanical equipment use and maintenance. Oil will be collected and stored separately in secondary containment. Oil will be potentially used on-site in waste oil burners. Examples of 'typical' used oil heaters and boilers that could be potentially used are shown in Appendix I. Oil that cannot be reused on-site will be shipped off-site as described in the Hazardous

Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011). If waste oil is used for fuel burner feedstock, it will comply with Government of Nunavut, Department of Environment, Environmental Guideline for Used Oil and Waste Fuel (June 2012) and impurity levels outlined in TABLE 4-5.

TABLE 4-5: MAXIMUM LEVELS OF IMPURITIES IN USED OIL/FUEL BURNER FEEDSTOCK

Impurity	Maximum Concentration (ppm)	
	Used Oil	Waste Oil
Cadmium	2	2
Chromium	10	10
Lead	100	100
Total Organic Halogens (as chlorine)	1000	1500
Polychlorinated Biphenyls	2	2
Ash Content	-	0.6% by weight

4.4.4 Non-hazardous Waste Materials Generated During Construction Operations

A large amount of material is generated during the construction operation, including packing materials, containers, temporary supports and general construction debris, used tools and pieces of construction material. It is anticipated that some of the contractors generating this waste will carry out their own salvage of economically worthwhile recyclables, particularly ferrous metals and copper, where a ready market exists. Typically tires, where the casings are sound, are retreaded for ongoing use, reducing the materials requiring final disposal. In some cases, large amounts of a single waste product will be produced, that can be readily source separated. Specific items identified at this time include:

- Timber - generated by unpacking, and from the disposal of temporary supports. Where possible shipments will be bought in on pallets that can be returned for reuse, thereby reducing the waste generated. Where timber waste consists of clean timber of useable size it will be stacked and made available for reuse. Timber that is not reusable will be disposed of via open burning. Chemically treated timber shall be separated and, if it cannot be reused, shall be disposed of in the landfill.
- Polyethylene film - film is used in large quantities to wrap and hence protect equipment. It is anticipated that substantial amounts will be generated by unpacking equipment. Opportunities for recycling this material will be explored and if practical the film will be baled and shipped for reuse. Otherwise, it will be disposed of in the landfill.
- Steel and other scrap metal waste shall be kept separate from the other solid waste produced during construction. Separation of steel and scrap metal from other solid waste shall be the responsibility of site personnel handling the materials. If economically worthwhile steel and other scrap metal waste will be shipped off site for recycling, otherwise it will be disposed of in the on-site landfill.

All other non-hazardous waste material will be separated at source into categories, based on potential for recycling, such as metal containers, water bottles, corrugated board, and the need for segregation for final disposal, such as tire casings.

4.4.5 Unset Concrete and Concrete Wash Water from Mixing and Transportation of Concrete

During the major works, concrete will be provided from a batch plant located at a construction laydown area. Waste concrete will arise from off-spec mixes, residual concrete at the end of a pour, and from wash down of the equipment.

A purpose built pond shall be used to receive all of the waste concrete and concrete contaminated wash water. The pond that will receive wash water will be designed to allow for settling of solids and decant; and analysis, and if necessary pH adjustment, prior to discharge will occur.

All fresh concrete and concrete product waste to be disposed of on-site shall be disposed of in the concrete waste pond. No concrete truck shall be cleaned anywhere else on-site. Waste hardened concrete will be either used as fill or disposed of in the landfill.

4.4.6 Camp Site Waste

Construction and permanent camps will provide housing for personnel across the Project and provide meals and other domestic support facilities. Wastes generated from this operation will be similar to normal residential domestic garbage, with a higher percentage of organic (food) wastes.

The camp operator will have responsibility for the management, including source separation and disposal, of all waste generated on site. Waste will be transported and disposed of as per Appendix A by the camp operator, using appropriate vehicles, equipped to stop any loss of either liquid or wind-blow during transportation.

The camp operator will be required to collect all waste in secure containers, and to remove organic (food) waste daily. All containers containing food waste or items potentially contaminated by food shall be secure against animal access.

4.4.7 Sewage Generated at the Various Working Locations

Sewage will be generated at all sites, throughout the period of construction and operation. See the Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010) for more information.

4.4.8 Hazardous Waste

Hazardous Waste handling and disposal is described in the Mary River Project Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.4.9 Other Miscellaneous Materials, or Items that No Longer Have Economic Value

During the operation miscellaneous tools, used parts, clothing etc. will be discarded. Items requiring special handling should be dealt with by the generator either by disposal or breakdown into readily handled components to be treated in accordance with the previous sections.

Parts shall be drained of oil or other liquids before disposal, with the drained fluids being disposed of as per Mary River Project Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.4.10 Office Paper

All white paper waste generated at the office or elsewhere on site shall be collected for disposal. To reduce the amount of paper waste generated on site the following list of procedures will be developed and implemented as practically feasible:

- Distribute electronically – Electronic forms increase the amount of desk/shelf space available.
- Double Sided Printing – When practical ensure all documents are double sided.
- Print Only the Pages You Need – Rather than printing the entire document consider saving the file electronically as well as cutting and pasting relevant information. Only reprint pages of documents that have been revised rather than the full document.
- Reuse – Collect single sided paper in a bin so that it could be reused for printing, faxing or scratch pad.
- Route Hardcopy Memos and Newsletters – Instead of making numerous copies, route one copy around the office.
- Copier Maintenance – Only allow qualified personnel to provide maintenance to all copiers and printers.

4.5 Incinerators

The main disposal method for combustible non-hazardous wastes generated on-site will be incineration. This method will eliminate problems associated with odours attracting wildlife, or the creation of poisonous or flammable gases through the decomposition of putrescible materials.

TABLE 4-6: INCINERATOR ALLOCATION

Site	Incinerable Waste Produced (t/day)	Incinerators Type	Total Capacity (as per design basis)
Mine Site	1.23	ECO 2TN Mobile Incinerator	2 tonnes
Steensby Port	0.09	500 lbs/Batch Incinerator	0.5 tonnes
Milne Port	0.50	ECO 2TN Mobile Incinerator	2 tonnes

The locations of the incinerators are shown in Appendix F. The incinerator allocation is presented in TABLE 4-6. The primary project incinerator model, ECO 2TN Mobile Incinerator, Operating and Maintenance (O&M) Manual is presented in Appendix C. All incinerators will have the option of using a liquid waste system to burn waste petroleum products such as used oil or off-spec fuels, which would decrease diesel requirements but would increase power consumption. Larger or additional incinerators may be brought on-line as required to meet the Project's needs during the construction phase. Prior to commencing any incineration of on-site Project wastes, Baffinland will conduct at a stack test immediately following the commissioning of each temporary and permanent incinerator. Stack test results shall be reported to the NIRB and Environment Canada annually as required. All incinerator systems will operate in accordance with the Nunavut's Department of the Environment's Environmental Guideline for the Burning and Incineration of Solid Waste (Government of Nunavut, January 2012). This includes all regulatory guidelines, operating procedures and best management practices whenever feasible.

Waste that is destined for the incinerator will be segregated as part of operating procedures to ensure that only appropriate materials will be incinerated. Hazardous wastes, non-combustible materials, or treated wood products must not be incinerated. The incineration of plastics will be minimized to the maximum extent practicable. Incineration of some food-related and other plastics is unavoidable; however, best efforts will be made to reduce volumes of potentially dioxin/furan related plastics during the procurement process.

4.5.1 Personnel Training Programs for Incinerator Operation

Only trained personnel in the Incinerator Operation Procedure (BAF-PH1-320-PRO-0002 r0) will operate the incinerator(s), and the equipment manual will be provided for maintenance. The incinerator manufacturer will be requested to provide on-site specialized training as required.

4.5.2 Air Emissions

Air emission standards establish limits on the levels of contaminants that can be released into the atmosphere. These standards are expressed as a concentration in the exhaust gases leaving the stack and are capable of being achieved using generally available technology or waste diversion practices. The following emission standards apply to solid waste incinerators operating in Nunavut and have been adopted from the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards for Dioxins and Furans and Mercury Emissions. For existing, new or expanding solid waste incinerators the maximum concentration (corrected to 11% oxygen at stack) of dioxins, furans and mercury in the exhaust gases from the stack are provided in TABLE 4-7.

TABLE 4-7: AIR EMISSION STANDARDS FOR SOLID WASTE INCINERATORS

Parameter	Numeric Standard	Explanation
Dioxins and Furans	80 pg I-TEQ/cubic metre	Unit of measure is picograms of International Toxicity Equivalents per cubic metre of air
Mercury	20 µg/R cubic metre	Unit of measure is micrograms per Reference cubic metre

		(the volume of gas adjusted to 25°C and 101.3 kilopascals)

Opacity in the incinerator stack should not exceed 5%. While it is not anticipated that opacity levels would exceed 1% to 2% under normal operation, values greater than 5% indicate the incinerator is not performing properly and additional performance evaluation and adjustment is required.

4.5.3 Ash Disposal

The management of bottom ash and other unburned residue is an integral part of sound waste management and the ash will need to be disposed of properly. Extreme care must be exercised when handling ash because of its physical (i.e. glass, nails) and chemical hazards. Closed or covered containers will be used when moving or transporting bottom ash from the incinerator to the final disposal site. This will minimize physical contact with the ash and any release of fine ash particles to the environment. Bottom ash will only be handled once completely cooled.

Ashes from the incineration process will be buried within a designated area of the landfill. A Toxicity Characteristic Leaching Procedure (TCLP) analysis will be conducted to ensure that the incinerator ash is suitable for disposal in the landfill. The TCLP Procedure Test method 1311 (US EPA) will be the preferred method to analyze the residuals as this test is designed to simulate the processes a material would be subjected to if placed in a landfill. The ash testing protocol shall ensure that an ash sample will be collected at the beginning of operation of the incinerator. The sample will be compared to the Government of Nunavut guidelines for solid waste/process residual concentrations suitable for landfills, as described in the Environmental Guideline for Industrial Waste Discharges and presented in TABLE 4-8.

Following the initial testing, ash samples will be collected and tested periodically and less frequently over time once results indicate consistent levels below appropriate guidelines, or upon a significant change in the source or type of material sent to the incinerator. If monitoring indicates the ash exceeds applicable guidelines and are not suitable for landfilling, an investigation will be undertaken to identify the cause and correct the problem. Ash that does not meet guidelines following TCLP analysis will be reprocessed on site if possible or transported for off-site disposal at an appropriate facility. Records of analytical results and volumes of ash will be maintained on-site, and will be available upon request to inspectors

TABLE 4-8: GUIDELINES FOR SOLID WASTE/PROCESS RESIDUALS SUITABLE FOR LANDFILL

Parameter	Concentration maximum (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	500

Carbon Tetrachloride (tetrachloromethane)	0.5
Methyl Ethyl Ketone	200
Polychlorinated Biphenyls (PCBs)	50 (concentration by mass)
Polychlorinated Dibenzo Dioxins and Furans	0.0000015 (I-TEQ)
Tetrachloroethylene	3
Trihalomethanes (Total)	10
Vinyl Chloride	0.2

Source: Guideline for Industrial Waste Discharges in Nunavut, April 2014

4.5.4 Monitoring During Operation

Monitoring of the incinerators will be conducted in conjunction with other monitoring programs required for the Project. Specifically, incinerators will be routinely inspected for signs of leakage, corrosion or other physical defects. If defects are identified, an assessment of health, safety, and environment risk must be undertaken prior to further operations and if significant risks are identified repairs must be completed before the equipment is used again. An initial stack test was conducted upon commissioning in 2013. It confirmed conformance with all applicable regulations based on a 'typical' waste stream. Stack test results will be reported to the NIRB and Environment Canada annually as required.

The operation of incinerators will be monitored using on-line sensors capable of continuously measuring the combustion process; this includes temperature in both the primary and secondary burn chambers, as well as in the stack. Temperature readings outside of the normal range can warn the operator that the system is not working properly. The combustion process monitor will be equipped with visible alarms to warn operators of poor incinerator operation.

Written records will be kept by incinerator operators of what waste is burned, when and how much.

Other record keeping requirements include:

- Readings from the process monitoring instruments.
- Repairs and maintenance performed on the incinerator and monitoring instruments.
- Major changes in operation.
- Quantity, condition and TCLP analysis results of the collected bottom ash.
- Operator training.

Records will be maintained on-site throughout the operational life of the facility and be made available to Inspectors and other regulatory officials upon request.

4.6 Open Burning

The disposal method for untreated wood, cardboard, and paper products generated on-site will be open-burning. This method will reduce the volume of inert waste disposed of in the landfill. Waste that is destined for open-burning will be segregated as part of operating procedures to ensure that only

appropriate materials will be burned. Hazardous wastes, non-combustible materials, food waste, plastics or treated wood products must not be open-burned. Secondary waste segregation will occur during the loading process of the burn cans. Any waste found in the area that does not meet the required criteria for open burning will be removed, properly segregated, and disposed of in the appropriate locations in accordance with Baffinland's Waste Sorting Guidelines.

Locking gates have been installed to restrict the access to these areas to authorized personnel only, in much the same manner as the landfill. Also, clear signage has been posted at the burn locations outlining both acceptable and unacceptable waste types for the open burn facilities as well as the Baffinland's standard operating procedure for Open Burning. This will in turn reduce the possibility of unauthorized deposition of unacceptable wastes to the locations, which could inadvertently be introduced into the burn.

Open burning shall occur only with a permit that is current and in good standing and that covers the period required. In the event of non-compliance of the procedure or in the event of an environmental or safety infraction, the permit may be revoked for a specified period of time until corrective action is implemented to the satisfaction of the Site Services and Environmental Managers.

4.6.1 Personnel Training Programs for open burning Operation

The operators will be trained on the specific requirements necessary to maintain compliance. This training will consist of reviewing both the waste sorting guidelines as well as the Open Burning of Untreated Wood, Cardboard and Paper Products Procedure (BAF-PH1-300-PRO-0001) and records will be kept of the persons who have received the training.

4.6.2 Ash Disposal

Bottom ash from the open burning of paperboard packing and untreated wood waste is suitable for burial in the landfill. Ash will be removed from the open burn boxes on a weekly basis when burning is occurring. The ash will be allowed to cool prior to placement in the landfill.

4.6.3 monitoring during operations

The management of bottom ash and other unburned residue is an integral part of sound waste management. Weekly inspections of the burn areas will be conducted by environmental personnel to ensure that all wastes being deposited in the area are in compliance with the procedure and that the area is kept tidy as well as to ensure that the ash from the burn cans is being emptied on a regular basis. Also, the approximate quantity and general types of waste (based on visual estimation of volume to nearest cubic meter) will be noted on a form to be filled out whenever open burning occurs.

4.7 Inert Landfill

A central inert landfill has been constructed near the Mine Site. The landfill design was submitted to the NWB for approval before construction, as required by the water licence. The landfill is used for disposal of inert, non-combustible waste only (plastics, cement, sand, used construction materials, scrap metal,

pipes, glass, etc.). Non-hazardous waste, including ashes from the incineration and open-burning of clean wood processes, and waste which cannot be salvaged or incinerated, will be deposited in this site. There will be no disposal of food waste, hazardous materials, paper products or biomedical waste in the landfill. The locations of the landfill is shown in Appendix B. The quantities of inert waste expected are presented in Table 4-3.

4.7.1 Operating Procedure

Regular cover will be applied to reduce the risk of wind-blown debris, and the landfill will be engineered for closure. Cover material will be placed to a thickness of 0.1 m between cells, 0.3 m on the surface of cells, and, 1.5 m for closure. The area method will be used to place the waste in the landfill. Once the first layer is completed and covered, a second layer will be formed.

Compaction of waste will be undertaken typically once per week or in combination with collection frequency, depending on the nature of the waste and the availability of fill material. Generally the waste will be worked and compacted as they are dumped. Operations will be undertaken to minimize close-out requirements. Refer to the Landfill Maintenance and Operation Manual (BAF-PH1-320-T07-0004) for additional operation details.

4.7.2 Personnel Training Programs for landfill Operation

The operators will be trained on the specific requirements necessary to maintain compliance. This training will consist of reviewing both the waste sorting guidelines as well as the Landfill Maintenance and Operation Manual (BAF-PH1-320-T07-0004) and records will be kept of the persons who have received the training.

4.7.3 Monitoring during operation

Routine inspection and monitoring will be undertaken in terms of waste volume, type, source, water seepage, etc. Specifically, landfill monitoring will include:

4.7.3.1 VOLUME AND WASTE COMPOSITION:

The annual volume of waste disposed of in the landfill will be determined by established survey methods.

4.7.3.2 WATER SAMPLING AND SOIL:

The “Guidance Manual on Sampling and Data Management for Contaminated Sites” (CCME 1993) will be followed for all water and soil quality monitoring. Refer to the Site Water Management Plan for surface water sampling locations and procedures. A soil sampling program will be initiated at several locations around the landfill site(s) prior to construction and after the initial perimeter berm.

4.7.3.3 GROUND TEMPERATURE MONITORING:

It is expected that the active layer will a grade into the landfill waste and cover material. Ground temperatures are not expected to increase based on the types of inert wastes to be disposed. During regular landfill inspections, signs of ground warming will be monitored by watching for evidence of soil creep.

4.7.3.4 LEACHATE MONITORING:

Leachate production is not expected based on the relatively dry, inert nature of the waste to be placed in the landfill. However, periodic surface water monitoring will allow for the detection of landfill leachate, in the unlikely event leachate is generated. The water licence(s) provides for monitoring of surface runoff from the facility and provides water quality objectives that must be met.

4.7.3.5 INSPECTION AND MAINTENANCE:

Routine visual inspections will be conducted for various components of the landfill, including the berms, fencing (if installed), etc. If required, maintenance will be completed as soon as a problem is identified. Records will be kept of all inspections and maintenance implemented, and these records will be summarized in the annual report.

4.8 HAZARDOUS WASTE STORAGE AND DISPOSAL

Some of the materials included in the waste streams are classified as hazardous wastes because of the potential risk to human health and safety, property and the environment. Hazardous wastes that will be generated on-site will include, but not be limited to: used oils, solvents and paints, used and/or surplus chemicals, medical wastes, gas cylinders, electronic waste, batteries, light bulbs, and smoke detectors.

Baffinland is responsible for ensuring that all hazardous waste generated on its site will be properly managed from the time it is generated to final disposal. Hazardous waste must be properly stored, transported, treated and disposed. Contractors can manage waste on behalf of Baffinland; however, Baffinland is responsible for ensuring, in advance, that the waste management method is acceptable.

All Hazardous waste will be managed according the Mary River Project Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.9 ON-SITE TREATMENT OF HYDROCARBON CONTAMINATED MATERIAL

Soils contaminated by hydrocarbons from spills will be managed as per the Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

4.10 OILY WATER

Baffinland will generate oily water over the course of the course of the Project lifecycle. Oily water will be managed as per Fresh Water, Sewage and Wastewater Management Plan (BAF-PH1-830-P16-0010).

4.11 SHIP WASTE MANAGEMENT

Baffinland will not accept hazardous waste originating from a ship and any non-hazardous waste generated during on site activities will be carefully monitored. All vessels will be equipped with a sewage treatment plant and an incinerator for solid and wet wastes.

4.12 Used Tires

Used tires are a major waste stream for most mining operations. Used tires will be either stockpiled for shipment off site (re -treading, re-use, or disposal) or will be disposed of on site in a segregated area of the landfill, or in a designated location within the footprint of the waste rock pile at a depth that will allow for permafrost aggradations. Options that increase project sustainability will be taken advantage of if used tires can be re-used on site in an environmentally safe manner (e.g. road barriers).

4.13 Propylene Glycol

Propylene glycol will be used at site airstrips for plane de-icing and in some scenarios, for winterizing of camps/buildings. Although biodegradable, all storage, handling, use and disposal of propylene glycol will be done in contained areas to avoid spills to the environment and as described by the manufacturer MSDS sheet. Prior to use propylene glycol will be stored in tightly closed containers or tanks in a cool, dry, well-ventilated area away from incompatible substances. Used propylene glycol will be collected, and then stored in the waste management temporary storage facilities on site in secured containers for shipment and off-site disposal.

4.14 Ocean bottom sediments

Compaction, leveling, and removal of the ocean bottom in the vicinity of the Milne Port ore dock structure will be required for the safe docking of ships. Removed material will be used as backfill within the ore dock structure. There will be no disposal of this material on land.

4.15 EPP Procedures Relevant to this Waste Management Plan

The following table outlines the EPP procedures that are relevant to the Waste Management Plan. The EPP is a living document and is subject to on-going updates.

TABLE 4-9: CONTENT OF THE EPP RELATED TO THE WASTE MANAGEMENT PLAN

Section	Title/Description
2.5	Geotechnical Drilling Operations
2.6	Equipment Operations
2.7	Fuel Storage and Handling
2.14	Solid Waste Management
2.15	Sewage Treatment
2.16	Hazardous Waste Management
2.17	Road Construction and Borrow Development
2.19	Road Traffic Management
2.21	Exploration Drilling Operations
3.7	Off-Site Waste Disposal Log

5 ENVIRONMENTAL RESPONSIBILITIES

5.1 ROLES AND RESPONSIBILITIES

The Baffinland Environmental Team is organised into two parts, on site as well as off site. The organisational structure for the Mary River Project in relation to the environment discipline is shown in the FIGURE 5-1 below. Communication channels are described as liaisons in the tables outlining the responsibilities and accountabilities in the following sections.

5.1.1 ENVIRONMENTAL PROJECT TEAM

5.1.1.1 THE BAFFINLAND ENVIRONMENTAL TEAM

The Baffinland Environmental Team will oversee all environmental and community works on and off site. The Baffinland Corporate Environmental Team responsibilities are summarized in TABLE 5-1.

TABLE 5-1: BAFFINLAND IRON MINES CORPORATION SENIOR MANAGEMENT

Baffinland Iron Mines Corporation Senior Management	
Position	**Responsibilities and Accountabilities**
Project Director	- Reports to Baffinland's CEO - Overall accountability for the Project execution - Allocation of resources (human and financial) for the implementation of Baffinland's commitments and objectives related to health, safety and environment during construction of the Project - Accountable for on-site environmental, health and safety performance during construction of the Project
VP Operations	- Reports to Baffinland's CEO - Overall accountability for the operation of the Project - Allocation of resources (human and financial) for the implementation of Baffinland's commitments and objectives related to health, safety and environment during operation - Accountable for on-site environmental, health and safety performance during operation
VP Sustainable Development, Health, Safety and Environment	- Reports to Baffinland's CEO - Establish corporate environmental policies and objectives - Monitors and reports on Baffinland's performance related to environmental, health and safety policies and objectives - Community liaison - Liaise with regulatory authorities - Obtains necessary permits and authorizations - Monitors compliance with terms and conditions of permits and licences - Routine EHS audit of contractor performance while on site
Manager Purchasing and Contract	- Reports to Baffinland's Project Director - Accountable for procurement and purchasing - Ensure that environmental commitments, policies and objectives are included in all contract documents

Baffinland Iron Mines Corporation Senior Management	
Position	**Responsibilities and Accountabilities**
VP Corporate Affairs	- Reports to Baffinland's CEO - Accountable for external communication (Governments, media, NGO, others) related to Baffinland's press release and overall communication of site incidents/events

The Baffinland Environmental Team will oversee all environmental activities on site. These responsibilities on site are outlined in TABLE 5-2.

TABLE 5-2: BAFFINLAND IRON MINES CORPORATION ON-SITE ENVIRONMENTAL TEAM

Baffinland Iron Mines Corporation On-Site Environmental Team	
Position	**Responsibilities and Accountabilities**
Environmental Manager	• Reports directly to VP Sustainable Development, Health, Safety and Environment and Indirect reporting and coordination with Operations VP and Director Environment • Overall accountability for environmental staff and performance at site • Coordinates implementation and monitors the performance of the Environmental Management System at site • Liaises with the senior management, regulators and stakeholders • Ensures effective monitoring and auditing of environmental performance of departments and contractors on site and identifies opportunities for improvement • Monitors compliance with permits, licenses and authorizations • Ensures all regulatory environmental monitoring and reporting requirements (monthly, annual) are met • Leads and coordinates site permitting requirements. • Initiates and oversees environmental studies • Oversees investigations and reporting of environmental incidents to regulatory bodies, stakeholders and senior management • Reviews and updates environmental management plans
Environmental Superintendent	• Reports to Environmental Manager • Specific accountabilities for environmental monitoring and reporting • Leads investigations and reporting of environmental incidents onsite • Serves as the liaison for regulators during onsite inspections and visits • Provides ongoing environmental education and environmental awareness training to all employees and contract workers • Oversees environmental database management • Prepares updates for management plans
Environmental Coordinator	• Reports to the Environmental Superintendent and Manager • Specific accountabilities for environmental monitoring and reporting • Provides day to day direction to Environmental staff onsite • Serves as a liaison for regulators during onsite inspections and visits. • Provides ongoing environmental education and environmental awareness training to all employees and contract workers • Assists with environmental database management
Environmental Advisor	• Reports to the Environmental Superintendent and Manager • Specific accountabilities for environmental monitoring and reporting

Baffinland Iron Mines Corporation On-Site Environmental Team	
Position	**Responsibilities and Accountabilities**
	• Assists with environmental database management • Prepare updates for management plans
Environmental Monitor and Technician	• Reports to the Environmental Superintendent or designate • Assists with environmental database management • Assists with monitoring and sampling activities as per the Project's management plans
QIA Monitor	• Works alongside the Baffinland Environment Department to ensure the proper implementation of all environmental management and monitoring plans • Acts as the QIA liaison for onsite environmental matters
Environmental Support Groups (Consultants, etc.)	• Assists with sampling, monitoring and reporting activities as required by permits, licenses and environmental management plans • Provides technical expertise to various environmental studies

5.1.2 Mary River Project Organizational Charts

For further information regarding the Mary River Projects organizational structure in relation to the environment discipline, please refer to the FIGURE 5-1 below:

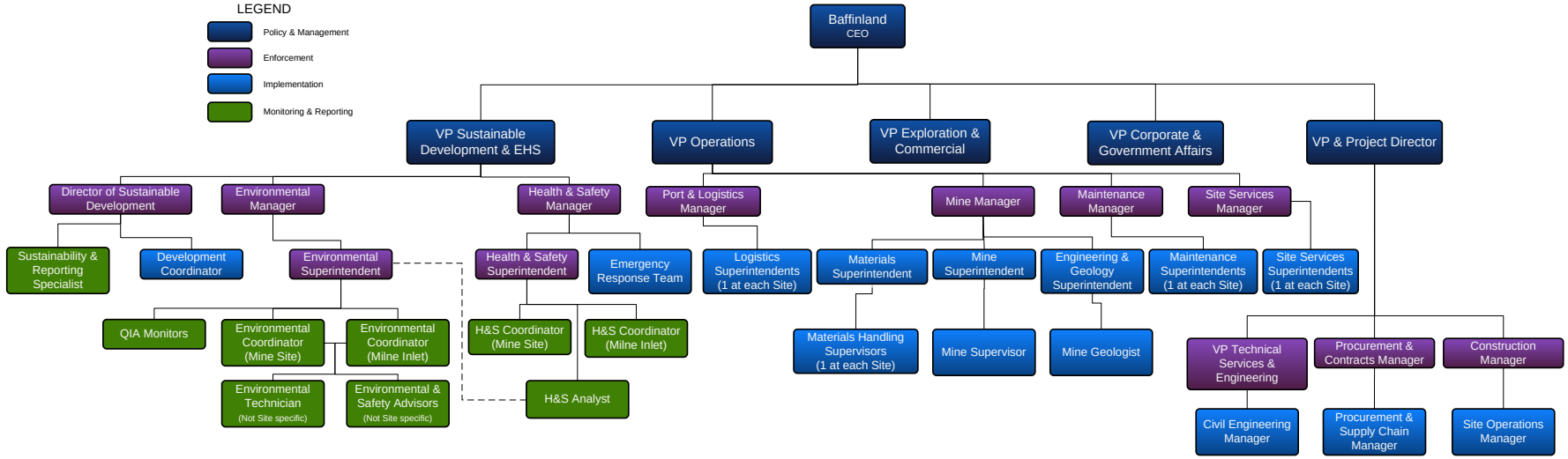

FIGURE 5-1: MARY RIVER ORGANIZATIONAL CHART

5.2 Training and Awareness

Staff and sub-contractors working on site will receive environmental training as part of the Site Orientation, to achieve a basic level of environmental awareness understanding of their obligations regarding compliance with regulatory requirements, commitments and best practices.

Operations superintendents and contractor supervisors will be provided with this Management Plan, and will receive additional orientation with respect to the requirements outlined in this Plan. In addition, all supervising level staff and sub-contractors will be provided with the Operational Standards (found in the Environmental Protection Plan) as a written guidance for their work.

Targeted environmental awareness training will be provided to both individuals and groups of workers assuming a specific authority or responsibility for environmental management or those undertaking an activity with an elevated high risk of environmental impact. These will be delivered in the form of toolbox/tailgate meetings or other means as appropriate.

The content of the environmental component of the site induction will include at a minimum:

a) Location of environmental sensitivities.

b) Location of additional information on environmental matters.

c) Due diligence responsibilities.

d) Responsibilities related to waste management, minimizing noise as necessary, road traffic rules, etc.

e) Principles and necessary steps to avoid encounters with bears or other wildlife and what to do if one such encounter occurs.

With respect to hazardous materials management, Baffinland will have a training and awareness plan which will consider:

- The differing level of risks and potential consequences associated with different types of hazardous materials.
- The different responsibilities, abilities, and literacy of employees.
- The culture of the employees.
- Contractors involved and their relevant experience/expertise.
- The trainers, training methods, and settings.
- Training frequency.
- Documentation of training and evaluation of training.

Baffinland will regularly review and update the training and awareness plan based on changes in training needs and regulatory required training.

5.3 COMMUNICATION

The types of communications for which members of the team will participate include the following:

a) Formal written correspondence and meetings with stakeholders.

b) Site visits by community representatives.

c) Design, construction and planning meetings.

d) Field inspections and monitoring reports disseminated by the Environmental Manager.

e) Electronic communications.

f) Tailgate/toolbox meetings.

g) Formal written correspondence and meetings with government regulatory bodies.

h) Formal environmental awareness training.

Communications will be appropriately recorded and filed for future reference. Where appropriate, the copies of communications will be forwarded to the Operations Manager(s), and Environmental Manager.

5.4 EXTERNAL COMMUNICATIONS

Effective forms of communication include the proactive notification to external stakeholders of Project activity. Project activity updates will be provided to the communities of North Baffin through various means including regular meetings, public notices and radio announcements as appropriate. Baffinland will maintain Community Liaison Offices to assist in this regard.

5.5 CONSTRUCTION

During the construction phase of the Project, the Baffinland Environmental Manager and EPCM (Engineering Procurement and Construction Management) contractor will be responsible for implementing this Plan.

This Management Plan will be updated to take into account the numerous construction sites, and types of construction equipment utilized. The organizational structure of the EPCM contractor will reflect the complexity of the construction phase.

5.6 OPERATION AND CLOSURE

For the operations and closure phases, Baffinland will revise its organizational structure to reflect the realities of the operation. The Environmental Manager will be responsible for subsequent updates and implementation of the Plan.

6 PERFORMANCE INDICATORS, THRESHOLDS, AND INCIDENT RESPONSE

Periodic inspections of waste management facilities will ensure compliance with this waste management plan. The EPP and associated operations procedures/work instructions outline detailed procedures for handling and storage of fuel, lubricants and other waste materials. These procedures are in place and training will be provided to all employees and contractors on waste handling. Accidental spills are the most likely type of environmental incident to occur while conducting the above mentioned activities. Response procedures, documented in the EPP, the Emergency Response Plan, and the Spill Contingency Plan, are in place to deal with these occurrences.

The ultimate performance indicator for hazardous materials management is the number of incidents of non-compliance reported on a daily or monthly basis. Incidents of non-compliance are classified by type and each type entails remedial actions as outlined in Hazard Identification and Risk Assessment Procedure (BAF-PH1-830-PRO-0001).

Where an investigation triggers a review and update of established EPP procedures, these reviews and update will be carried out in accordance the procedures established by Baffinland's EHS Framework Standard (BAF-PH1-830-STD-0001).

7 MONITORING AND REPORTING REQUIREMENTS

7.1 WASTE MONITORING

Waste monitoring includes the visual inspection of the main components of the waste management system (described below) and the measurement and recording of wastes taken off site. The following information will be reported on an annual basis as currently is the practice:

a) The quantities hazardous waste transported off-site for disposal.

b) The location and name of the disposal facility for each waste type.

c) The date that each was hauled off-site for disposal, for each occasion that these are removed from the site.

d) Quantities of non-hazardous inert solid wastes disposed in the landfill.

e) Quantities of hydrocarbon contaminated soils and water processed in treatment facilities.

Inert solid wastes will be stored and disposed in a manner that minimizes the opportunity for windblown debris and animal attraction. Any wastes that are shipped off site will be recorded using an Off-Site Waste Disposal Log or equivalent developed from the EPP.

Regular visual inspection of waste management facilities will be conducted by the Environmental Manager to ensure proper operation and adequate environmental/health and safety controls are in place.

Waste audits will be undertaken periodically generation points to ensure waste streams are properly segregated.

7.1.1 INCINERATOR MONITORING

Monitoring of the incinerator operation involves ensuring proper operation and that appropriate wastes are incinerated as described in section 4.5 as well as per the Incinerator Operation Procedure (BAF-PH1-320-PRO-0002, Appendix C).

7.1.2 OPEN BURNING MONITORING

Open burn activities will be monitored based on the Open Burning of Untreated Wood, Cardboard and Paper Products Procedure presented in Appendix H as well as described in section 4.2.

7.1.3 LANDFILL MONITORING

Landfill activities will be monitored as described in section 4.7 as well as per the Landfill Maintenance and Operation Manual (BAF-PH1-320-T07-0004). It involves visual inspections to ensure that only inert wastes are deposited in the landfill, and that adequate cover is provided so that wastes are contained and are not being dispersed by the wind. The Landfill Inspection Form is included in the EPP. Wastes will be managed and monitored for compatibility with landfill disposal prior to disposal in the landfill.

7.1.4 Hazardous Waste Monitoring

All Hazardous waste will be monitored according the Mary River Project Hazardous Material and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

7.1.5 Landfarm Monitoring

Landfarm activity will be monitored according the Landfarm Operation Maintenance and Monitoring Manual (BAF-PH1-320-T07-0004) as presented in the Hazardous Material and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011).

7.2 Operations Monitoring

In addition to specific monitoring and reporting requirements under the regulatory approvals such as the water licence, QIA land lease, land use permits, and fisheries authorization as well as monitoring of project effects, the Environmental Manager will coordinate routine inspections of various aspects of the operations. Routine inspections are conducted to confirm overall conformance with the requirements of the Waste Management Plan, companion EPP, and operating procedures/work instructions, and will include inspections of site-based waste management activities.

Compliance Monitoring Forms are used to document the findings and required actions. These reports are generated as an internal operational management tool to promote continuous improvement in environmental performance and stewardship. Checklists are used as internal operational monitoring and compliance tools. These checklists are integrated into the EPP and other operating procedures/work instructions.

7.3 Data Management

The Environmental Manager is responsible for data management and reporting related to waste management. The data management system includes conducting routine inspections and monitoring, and providing these results to appropriate parties as required.

7.4 Water Licence Reporting

Since waste disposal is regulated by the Nunavut Water Board (NWB) through the water licensing process, there will be monthly water licence reporting requirements. An annual Project report will be prepared that addresses requirements specified by the water licence, the Nunavut Impact Review Board (NIRB), and the landowners. Information likely to be included in reporting regarding waste disposal includes:

- GPS coordinates and photographic records of waste disposal facilities and status.
- Annual geotechnical inspection recommendations from a geotechnical engineer concerning the performance of lined and bermed waste containment structures.
- Quantities and fate of various types of waste on and off site

- Other details on waste disposal requested by the NWB.

Records of waste disposal activities will be available upon request to NWB and landowner's inspectors.

7.5 STAKEHOLDER REPORTING

Future arrangements regarding reporting could be made through the Inuit Impact Benefits Agreement (IIBA) or other mechanisms; this will be incorporated in future Plan updates.

8 ADAPTIVE STRATEGIES

Baffinland is committed to continual improvement in its work activities with the aim of reducing risks to the environment and improving operational effectiveness. The strategy employed at Baffinland is regular monitoring supported by operational change and adoption of other mitigating measures if warranted.

Housekeeping and operational measures have been instituted. As part of the EPP, work procedures will continuously be adapted with the goal to reduce, recover, reuse and recycle waste. Regular scheduled inspections of waste management facilities along with the non-compliance reporting system described in Section 9 will ensure continual improvement and adaptation of waste management strategies throughout the life cycle of the Project.

As per the requirements of Baffinland`s EHS Management Framework Standard (BAF-PH1-830-STD-0001), the company will conduct and document management reviews of its Waste Management Plan on a regular basis. Such reviews will ensure the integration of monitoring results for the waste management plan are integrated with other aspects of the Project and that necessary adjustments are implemented as required. These reviews also provide a formal mechanism to assess the effectiveness of the management in achieving the company's objectives and maintaining on-going compliance with Project permits and authorizations.

9 QA/QC

As per the requirements of Baffinland`s EHS Framework Standard (BAF-PH1-830-STD-0001), regular audits will be undertaken to ensure compliance with the current Waste Management Plan and that best management practices are implemented for waste management. The result of these audits will form the basis for an annual written statement of assurance by management on the effectiveness of its Waste Management Plan.

9.1 INCINERATORS

Camp incinerators are installed at camps associated with the Mary River Project. Each of these incinerators utilizes dual chamber, variable air flow design technology and is specifically designed for remote camp operations. QA/QC procedures for air emission monitoring are outlined in the Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002).

9.2 OPEN BURNING

Only appropriate material, such untreated wood and cardboards, will be open burn in order to prevent the release of dangerous toxins and/or emissions. Regular audits to ensure compliance with the current Waste Management Plan. The type and quantities of materials being burnt will be recorded. Records of open burn wastes will be available upon request to NWB and inspectors.

10 REFERENCES

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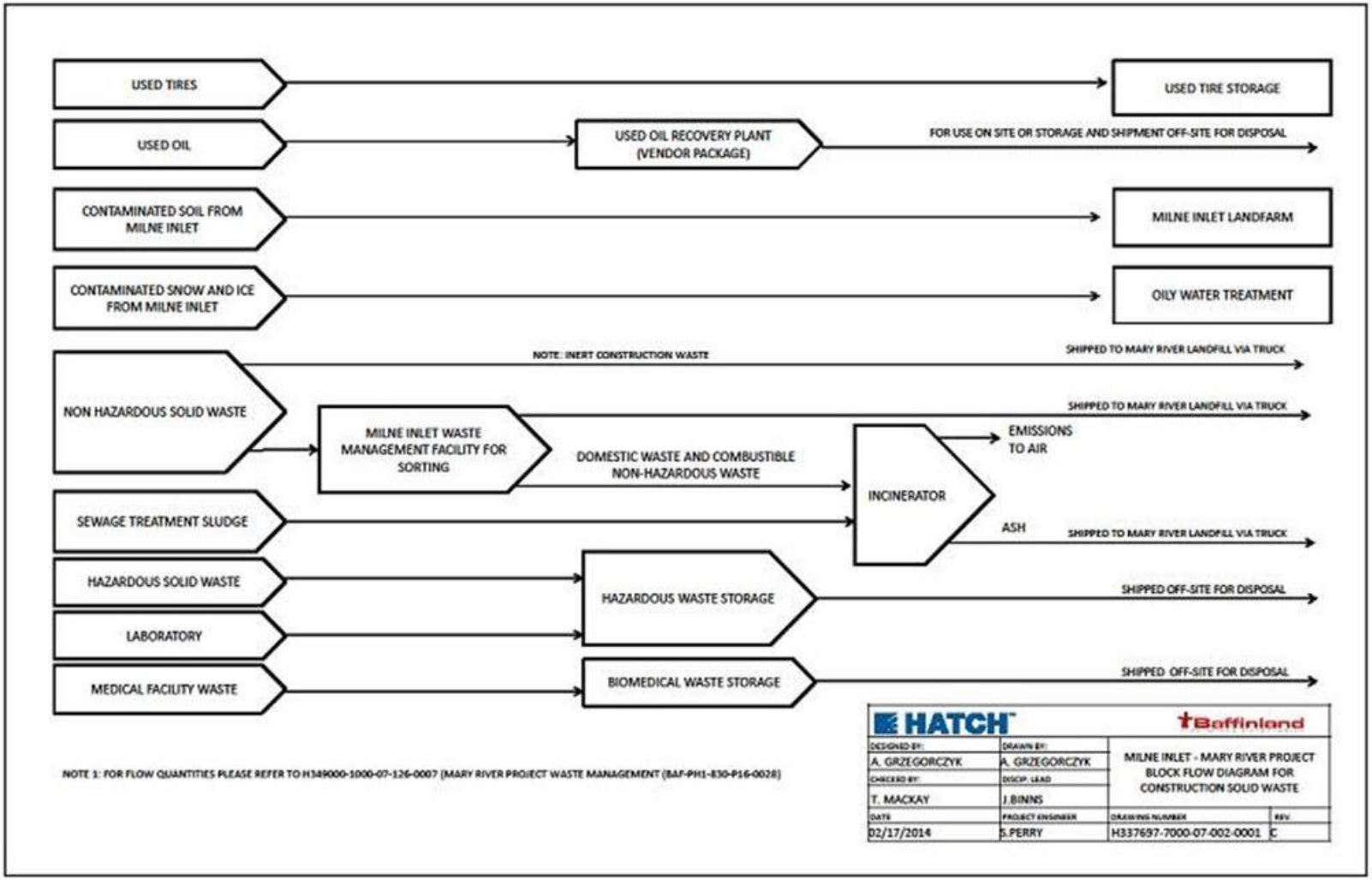
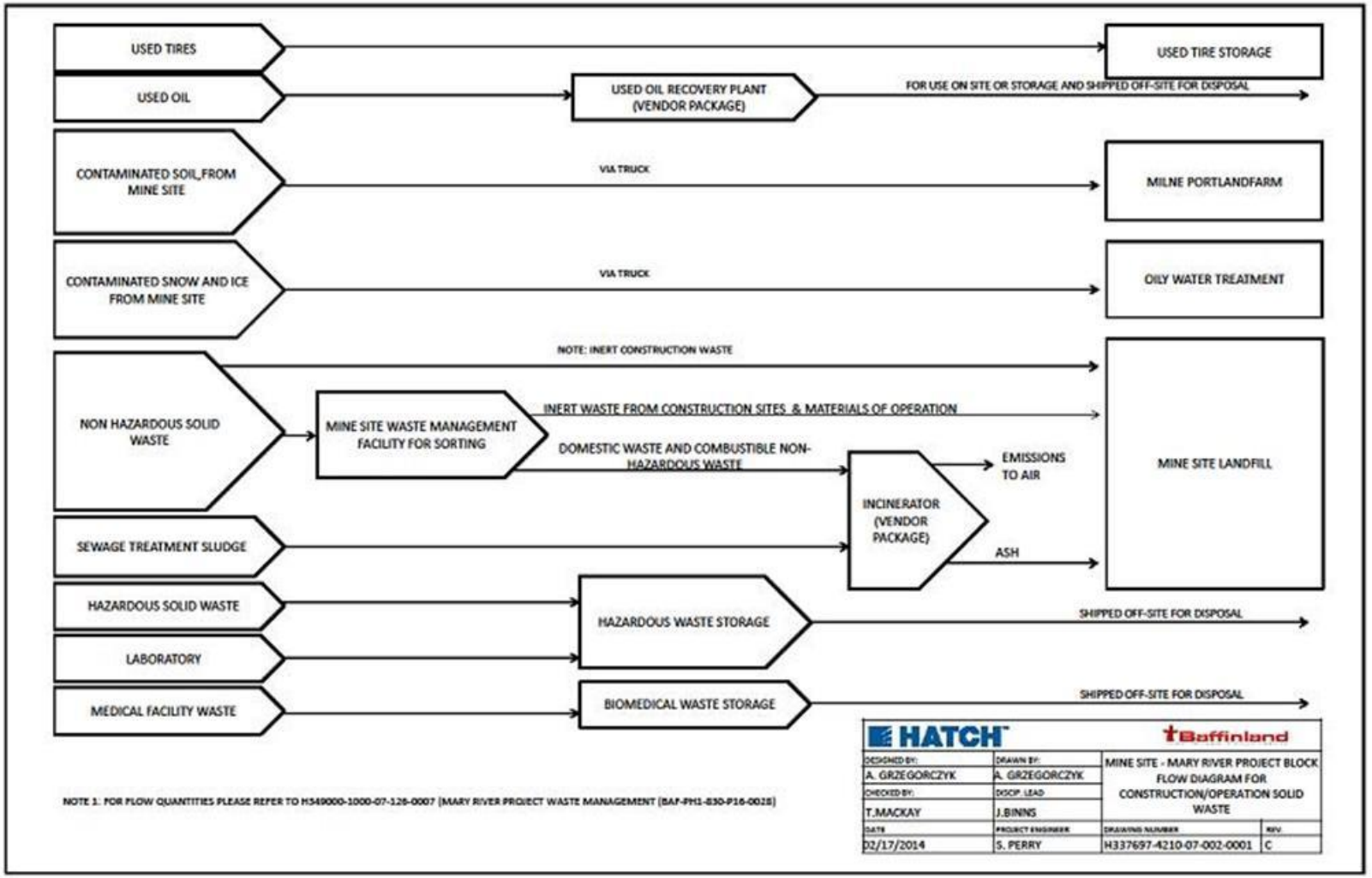
Appendix A -
Block Waste Flow Diagrams

- H337697-7000-07-002-0001 Milne Port - Mary River Project Block Flow Diagram for Construction Solid Waste
- H337697-4210-07-002-0001 Mine Site - Mary River Project Block Flow Diagram for Construction Solid Waste

A.1 H334697-7000-07-0002-0001: Milne Port – Mary River Project Block Flow Diagram for Construction Solid Waste



A.2 H337697-4210-07-002-0001: Mine Site – Mary River Project Block Flow Diagram for Construction Solid Waste



Appendix B - Locations and Layouts of Waste Management Facilities

- H349000-2540-50-042-0001 Milne Port Waste Management Building General Arrangement
- H349000-4540-50-042-0001 Mine Site Waste Management Building General Arrangement
- E337697-0000-10-042-0001 General Arrangement of Typical Landfarm
- H337697-7000-10-042-0007 Milne Inlet Environmental Waste Management Facility
- H337697-4350-10-042-0001 Mine Site Environmental Waste Management Facility

Please refer to Appendix F for Milne Port and Mine Site Waste Facility Locations and Site Layouts

Appendix C - Incinerator Manual and Standard Operating Procedure

- ECO M2TN Mobile Incinerator Operating and Maintenance Manual
- Baffinland - Incinerator Operation Procedure (BAF-PH1-320-PRO-0002 r0)

EQUIPMENT MANUAL

EWS Mobile Incinerator: ECO M2TN

AUGUST 2013

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1.0 GENERAL INFORMATION

1.1 COMMON ACRONYMS

Acronym	Full Name
AC	Air Conditioning
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
Cd	Cadmium
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSA	Canadian Standards Association
DCH0	Default Channel Zero
DP	Delta Pressure (amount of pressure change)
EPC	Electronic Proportional Control
ESC key	Escape Key
EWS	Eco Waste Solutions
EWS Mobile	EWS Mobile Incinerator
H20	Water
HCl	Hydrochloric Acid
HCL	Hydrogen chloride
Hg	Mercury
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
ISO	International Organization for Standards
KPa	Kilopascals
LCD	Liquid Crystal Display
LED	Light-emitting Diode
MCR	Master Control Relay
ME	Mist Eliminator
MPCB	Motor Protection Circuit Breaker
N.C.	Normally Closed
N.O.	Normally Open
NO_x	Oxides of Nitrogen
O_2	Oxygen
Pb	Lead
PCCD/PCCF	Dioxins & Furans
PDT	Pole Double Throw
PET	Polyethylene Terephthalate
pH meter	pH meter
P&ID	Process & Instrumentation Diagram
PLC	Programmable Logic Controller
PM	Particulate Matter

Acronym	Full Name
PPM	Parts Per Million
SPDT	Single Pole Double Throw
SCFM	Standard Cubic Feet Meter
SO2	Sulphur Dioxide
SOC	Southern Operational Command
SOW	Statement of Work
SO_x	Oxides of Sulphur
SP	Static Pressure
TEFC	Totally Enclosed, Fan-Cooled
THC	Total Hydrocarbon
USB key	Universal Serial Bus
VDC	Volts Direct Current
VFD	Variable Frequency Drive
W.C.	Water Column

1.2 EWS CONTACT INFORMATION

	CONTACT INFORMATION	
Eco Waste Solutions	5195 Harvester Road, Unit 14	
	Burlington, Ontario, Canada	
	L7L 6E9	
Phone	905-634-7022	
Toll Free	1-866-326-2876	
Fax	905-634-0831	
email	info@ecosolutions.com	
Ask for/Address to	Customer Service Manager	

1.3 HEALTH & SAFETY PRECAUTION

1.3.1 Health and Safety Precautions

PLEASE READ THIS SECTION BEFORE READING THE REST OF THE MANUAL

1.3.2 Safety Warnings

 The **EWS Mobile Incinerator** has a number of safety related hazards that need to be recognized by all operators:

- Electricity
- Heavy mechanical parts which may move due to gravity
- High Temperature
- Explosive Gases
- Flammable Liquids

IMPORTANT POINTS TO FOLLOW

THE EWS MOBILE INCINERATOR CAN CAUSE SERIOUS INJURY OR DEATH, please follow these points below:

1.3.2.1 KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES.

1.3.2.2 BEFORE STARTING THE CYCLE OF THE SYSTEM ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE EWS MOBILE INCINERATOR.

1.3.2.3 DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD

1.3.2.4 RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED REST SOLELY ON THOSE OPERATION IT.

1.3.2.5 OBEY THE FOLLOWING GENERAL SAFETY INSTRUCTIONS AT ALL TIMES.

NOTA

A qualified operator is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work and shall be limited to Construction Engineering trades only.

1.3.3 General Safety Instructions

1.3.3.1 Keep the electrical panel doors closed at all times except when performing electrical maintenance or troubleshooting.

1.3.3.2 Allow only qualified operators to perform maintenance and troubleshooting on the machine.

1.3.3.3 Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.

1.3.3.4 Do not bypass or tie down any of the door safety limit switches.

1.3.3.5 Do not open any of the doors while the Primary or Secondary Chambers are above 200°F (93 °C).

1.3.3.6 Do not enter the Primary Chamber unless the Emergency Stop Button is pushed

1.3.3.7 When opening or closing the Primary Chamber door keep clear of the door and ensure that the path for the door is clear.

1.3.3.8 Secure the Primary Chamber door when it is open so it cannot move accidentally.

1.3.3.9 Immediately correct any fuel leaks.

1.3.3.10 Do not fill the Primary Chamber above the breech opening. Overfilling can result in poor burning and damage to the **EWS Mobile Incinerator.**

1.3.3.11 Use proper tools; wear impact resistant, CSA certified industrial goggles, full face dust mask (such as Advantage 3000 Respirator) and industrial leather gloves while loading and cleaning the **EWS Mobile Incinerator.**

1.3.3.12 Be aware of component-specific safety hazards listed within each section of this manual.

1.3.4 General Operating and Maintenance Safety Instructions

Proper operating and maintenance procedures must be followed in order for the **EWS Mobile Incinerator** to perform at maximum efficiency. Do not attempt to start or operate this equipment until this manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes. Safety procedures and precautions must be followed at ALL times during operation.

There are component-specific safety procedures outlined in this manual, however, no amount of written instruction can replace good judgment and safe operating practices.

NOTA

Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the **EWS Mobile Incinerator** to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance schedule be followed diligently (please refer to the Incinerator Maintenance Plan). It is advisable to keep an equipment log) for recording maintenance activities along with unusual operation. In the event that the equipment is not operating in the normal manner contact Eco Waste Solutions immediately (please refer to *Section 1.2 EWS Contact Information*). It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the **EWS Mobile Incinerator**. The preventive maintenance procedures outlined in Section 4 of this manual should be adhered to strictly for best service life.

The warranty will become void if proper maintenance is not performed as instructed.

Please note that some of the diagrams and/or photos in this EQUIPMENT MANUAL are conceptual in nature and may not be exact representations of equipment purchased.

2.0 OVERVIEW OF TECHNOLOGY

2.1 INTRODUCTION TO WASTE INCINERATION

2.1.1 Protecting the Environment

2.1.1.1 Why Incinerate?

An advanced technology incinerator like the **EWS Mobile Incinerator** is the basis of a pollution prevention approach to waste management for camp operations. Having an incinerator that can be transported to the point-of-need provides immediate and complete control over the disposal of camp waste.

Incineration is considered to be a sustainable waste management practice because it deals with the waste on-site and as it's generated. Landfills operate on the premise that once it is buried the problem is eliminated. However even landfills with the most advanced engineering can fail. The very fact that a landfill is forever predicts the deterioration and failure of landfill safety systems. The creation of a well-designed landfill has a high upfront capital cost, takes many months to build and requires on-going maintenance in perpetuity making them a poor fit for a mobile camp.

Often camps consider using open air burning to deal with waste. This may involve simply setting fire to the waste pile or the use of a barrel or pit to contain the waste while burning. Open air burning creates air pollution and can lead to damaging health effects for the operator and those living and or working nearby.

By contrast, modern advanced incineration with air pollution control allows for the complete destruction of domestic waste without polluting the air, land or water. The waste material is completely converted to a non-toxic ash that does not attract wildlife.

The primary advantages of incineration are:

- **REDUCTION** of the weight and volume of waste material that must be disposed of using landfills or other means
- **DESTRUCTION** of materials that may be an attractant to wildlife and any pathogenic agents that may be contained within waste materials

2.1.1.2 The Operator – Your Role

As the Operator of the incinerator you have an extremely important role in protecting the environment through the correct operation of this equipment. It is the operator's role and responsibility to protect the environment by:

1. Ensuring that no inappropriate materials are processed and that each batch contains an average mix of waste that resembles the design waste characteristics (particularly volume/weight per batch, average density, and overall heat value). See Waste Table in Section 2.4.2 for details.

2. Understanding the environmental operating permits and commitments made by your employer to regulatory bodies and other stakeholders. This includes the emission targets, monitoring and recording requirements. Understanding the wastes that can and cannot be processed in the equipment as specified by the manufacturer as well as applicable regulatory permits or

other commitments. Undertaking all necessary operational and maintenance practices to ensure compliance with applicable emission limits and operating requirements.

3. Ensuring the burn cycle is long enough to allow for thorough burn-out and the generation of high quality ash residual that is safe for disposal

4. Minimizing particulate matter (dust) emissions during ash removal and handling

5. Disposing of ash properly by sending it to appropriate disposal sites

6. Taking responsibility for regular maintenance inspections and ensuring the appropriate attention is given to any problems immediately.

2.1.1.3 Air Pollutants of Concern

All combustion processes produce an exhaust emission. The **EWS Mobile Incinerator** is technologically advanced and designed to thoroughly combust the waste while producing minimal emissions.

Correct operation and rigorous attention to maintenance will ensure that the **EWS Mobile Incinerator** operates with the least possible impact on the environment.

It is recommended that incinerator operators understand the potential for the creation of pollution from incorrect operation. The following table lists the pollutants that can occur in incinerator exhaust emissions.

POLLUTANT	CONCERN	SOURCE OR CAUSE
CO (Carbon Monoxide)	Combustion Indicator	High levels of CO indicates poor quality combustion
SOx (Oxides of Sulphur)	Contributes to acid rain, respiratory irritant	High sulphur content fuels
NOx (Oxides of Nitrogen)	Contributes to acid rain, respiratory irritant	Incorrect air input, too high operating temperatures
HCl (Hydrochloric Acid)	Contributes to acid rain, corrosive, respiratory irritant	Primarily from the burning of PVC (polyvinyl chloride) plastics
PM (Particulate Matter)	Respiratory effects	Incomplete combustion, rich fuel to air ratio, dust-laden waste stream
PCCD/PCCF (Dioxins & Furans)	Persistent organic compound known to bioaccumulate	Incomplete combustion due to overloading, air ingress, improper waste mix
Heavy Metals including: Pb (Lead), Hg (Mercury), Cd (Cadmium), etc.	Toxic and known to be hazardous to human health and living ecosystems	Presence of heavy metals in the waste stream will lead to appearance in the exhaust gases

2.1.2 Basic Combustion Principles

Combustion is a rapid chemical reaction between oxygen and combustible elements such as carbon or hydrogen. Combustion uses the oxygen in air to react with the combustible materials producing heat which continues the process. Most of the products of combustion are gases. Good combustion produces clean gases that are invisible. Poor combustion will create smoke.

2.1.2.1 Products of Combustion Reaction (Ideal Combustion)

The ideal combustion reaction is often used to explain combustion. In the ideal reaction a completely combustible material - a compound of carbon, hydrogen and oxygen is heated and allowed to react with oxygen. As it is heated water is vaporized and the carbon bonds with the oxygen and heat is released.

Carbon, Hydrogen, Oxygen + Oxygen + $\longrightarrow$ Heat Carbon Dioxide + Water and Heat

2.1.2.2 Incomplete Combustion

This ideal reaction is theoretical and does not occur in waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases or system exhaust. The products of incomplete combustion are typically elemental carbon (or soot) and carbon monoxide (CO). Soot particles are very fine and generally result in high opacity (smoke) at the combustion stack. Other products of incomplete combustion that cause concern are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion chamber are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics will remain in the ash.

2.1.2.3 Combustion Indicators

One of the most obvious combustion indicators is the presence of a visible exhaust emission or smoke.

2.1.2.4 Stack Gas Oxygen and Carbon Monoxide

More reliable indicators that can be used to monitor combustion quality are the concentrations of key compounds in the stack gas.

2.1.2.5 Stack Gas: O_2 (Oxygen) concentration

The stack gas O_2 concentration provides a measure of excess air. Waste incinerators typically operate at 140 to 200 percent excess air, which roughly corresponds to 12 to 14 percent O_2 in the stack gas.

- High O_2 means too much excess air (cools gases).
- Low O_2 means insufficient air (incomplete combustion).

2.1.2.6 Stack Gas: Carbon Monoxide (CO) concentration

Each combustion system has a "typical operating range" for CO. If the stack gas, CO concentration goes above this typical range, combustion problems are likely. With a waste incinerator this is typically <100 ppm.

2.1.2.7 Waste Characteristics

Different waste types have different heating values, densities and moisture contents. These primary characteristics of the waste will affect the combustion process.

The **HEATING VALUE** of waste is a measure of the energy released when the waste is burned. It is measured in units of joules per kilogram (j/kg). The heating value is proportional to the energy released when burned. A heating value of about 11.6 MJ/kg or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel.

The **MOISTURE CONTENT** of waste is a measure of the quantity of water contained or saturated in solid dry waste material. It is measured by a ratio or a percentage. The wetter the waste, the higher the moisture content and the longer it will take the waste to burn. As a result, a longer burn time requires more fuel while operating the incinerator. On the contrary, drier waste has lower moisture content. This dry waste requires a shorter burn time which results in less fuel being required.

2.1.2.8 Ash Quality

Visual appearance of the ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. A noted increase in ash combustibles indicates a combustion problem which may include temperatures that are too low, improper distribution of combustion air in the chamber (plugged air inlets), or burn cycle time is too short.

2.1.2.9 Summary of Key Operation Factors Affecting Combustion

2.1.2.9.1 Combustion Air supply
- i. Sufficient air for complete reaction
- ii. Distributed to promote mixing

2.1.2.9.2 Mixing/Turbulence
- i. Assure contact of oxygen and organics

2.1.2.9.3 Temperature
- i. High enough to sustain combustion
- ii. High enough to complete reaction

2.1.2.9.4 Residence time/Retention time
- i. Sufficient time to allow reaction to complete

2.1.2.9.5 Waste Feed Characteristics

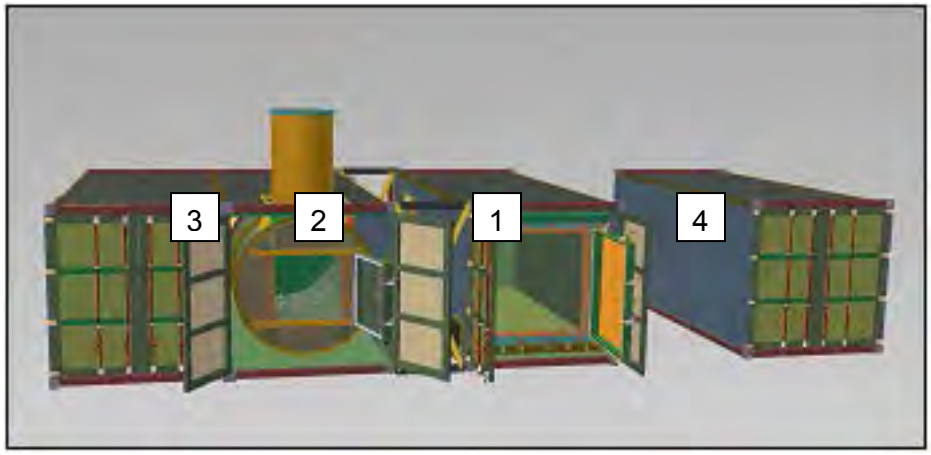
i. Waste feed must be representative of the waste feed assumptions used for the design of the incinerator

All of these key factors are interrelated.

2.1.3 Technology Overview

2.1.3.1 System Description

The **EWS Mobile Incinerator** is a fully containerized transportable waste incinerator system designed to meet the strictest environmental standards. The EWS Mobile Incinerator is comprised of 3 containerized modules and additional shipping container shown below.



View of the EWS Mobile Incinerator Containers

(Left to right: Container 3 - Controls Container, Container 2 - Secondary Chamber Container, Container 1 - Primary Chamber Container, Container 4 – Shipping Container)

2.1.3.2 System Process

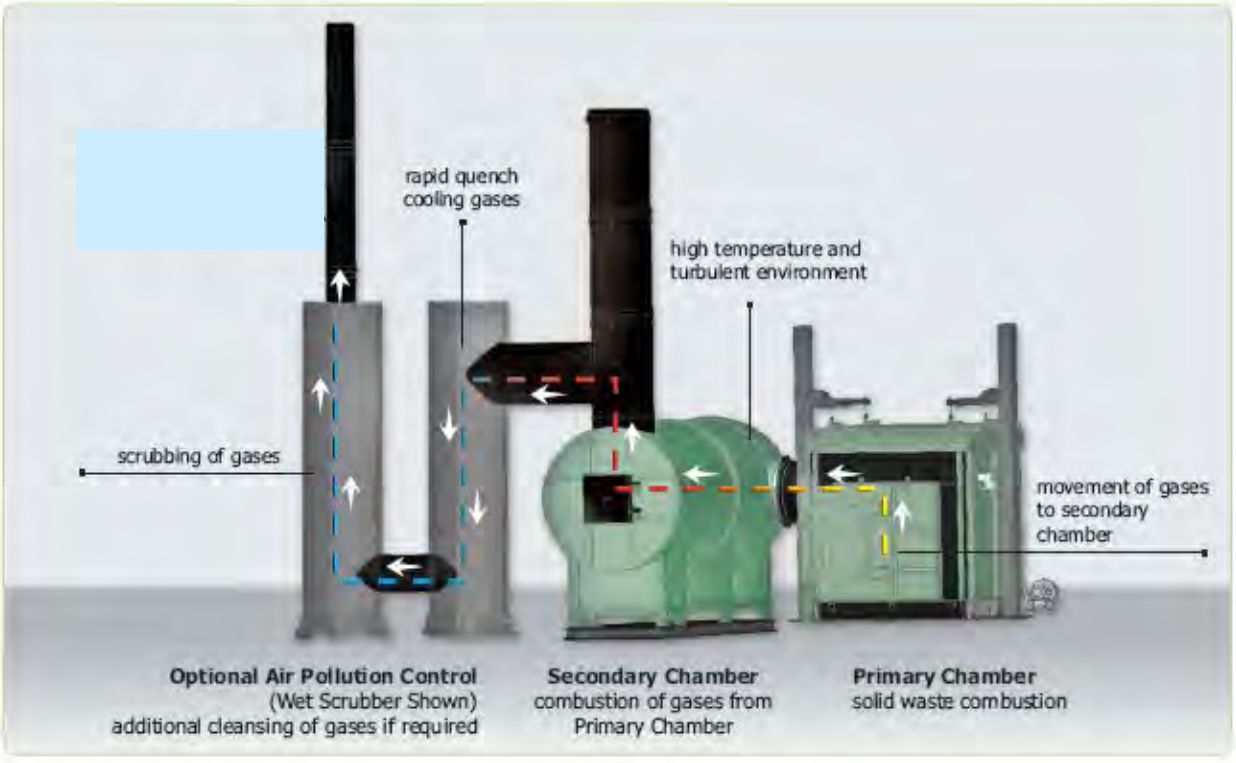
Stage One (Container 1 in diagram)
This container houses the incinerator's **Primary Chamber**. Waste is placed into the chamber until it is full, then the door is sealed shut and the system can be started. The waste will remain in this chamber, for the entire cycle, where it will be burned down to ash.

Stage Two (Container 2 in diagram)
This container houses the Incinerator's **Secondary Chamber** which burns the off-gases coming from the Primary Chamber that are continually formed as the waste is burned.

2.1.3.3 Process Overview

The following illustration depicts the process flow described previously and provides a schematic representation of the creation of gases and their flow through the system.

The system shown below is a graphic representation of the process and does not show the modules housed in ISO containers.



2.1.3.4 Functional Description of Major Components

The components within the Mobile Incinerator package that involve combustion are referred to as the incinerator. The main modules of the incinerator are the Primary Chamber and the Secondary Chamber. Both Chambers are large vessels constructed of steel with a special insulating liner known as refractory. The Primary and Secondary Chambers are described in detail below.

2.1.3.4.1 Primary Chamber

The **Primary Chamber** has a large front-opening door for loading of solid waste and removal of the ash residuals. Waste is loaded using a small skid-steer loader. The waste is dumped into the front of the chamber then pushed towards the back until full. Once the chamber is full, the door is closed and sealed shut using the toggle clamps. The operator will then use the control panel located in the Control Container to start the system. The Secondary Chamber must be at operating temperature before the Primary Chamber can activate.

To begin the process of burning the solid waste the **Primary Chamber Burner** is used to elevate the temperature of the Primary Chamber to ignite the waste. The burner package has a single motor that operates both the diesel fuel pump and combustion air supply fan of the burner. The burner ignites the fuel and supplies combustion air to create heat.

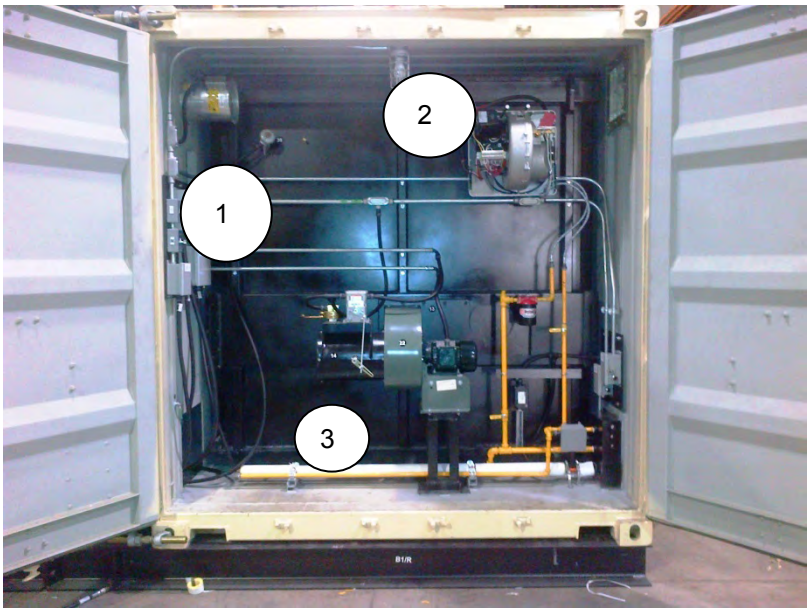
1. Louver
2. Container door
3. Opening for loading
4. Base frame
5. Toggle clamps

Front View: Primary Chamber Container (Chamber open)

A **Thermocouple** is used to measure the temperature of the Chamber. Once the Chamber reaches a temperature of approximately 650-850°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted will the burner periodically turn on.

The amount of heat released from the oxidation of the waste, is controlled by limiting the air into the Primary Chamber to less than what is required for complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and oxidized thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned to provide heat while the non-combustible portion accumulates as residual. These conditions ensure that the waste is allowed to fully combust and is rendered sterile. Waste volume is reduced by over 90%. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

This chamber also has a small **cooling fan**, typically referred to as the **Primary Chamber Blower**. The blower does not operate during the burn cycle but will activate automatically once the burn is complete and the system goes into cool down phase. The blower then cools the chamber for a period of 12 hours so that the chamber will be sufficiently cool for the Operator to safely remove the ash and begin to load a new batch of waste.



1. Thermocouple
2. Burner (Diesel-fired)
3. Primary Chamber Blower/Cooling Fan

Primary Chamber Container

2.1.3.4.2 Secondary Chamber

As waste burns in the Primary Chamber, gases containing the products of combustion are pulled continuously into the high temperature zone of the **Secondary Chamber** where the oxidation reaction of the combustible products is completed.

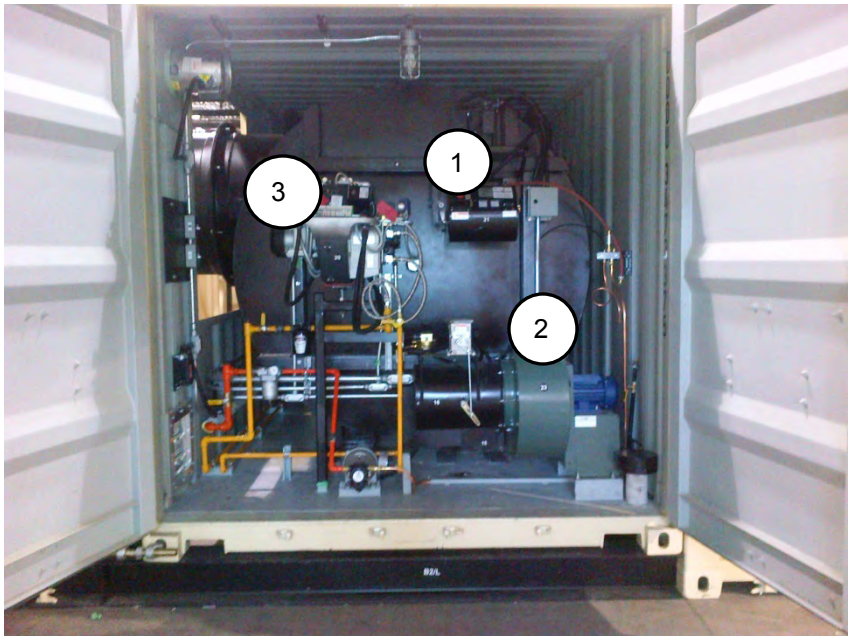
To accomplish this, the Secondary Chamber controls the temperature at 1000°C using a thermocouple to constantly measure the temperature inside the chamber. The temperature readings are monitored by the system's PLC and the PLC will initiate operational changes such as increasing or decreasing the speed of the **Secondary Chamber Blower** and the output of the **Secondary Chamber Burner (Diesel-fired).**

The **Secondary Chamber Blower** air is introduced into the chamber by an air ring manifold that surrounds the Secondary Chamber. The manifold has small air jets called tweers that open into the chamber at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) to control the speed of the fan and modulating motors on the blower inlet dampers.

The blower is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the chamber and prevent temperature overruns.

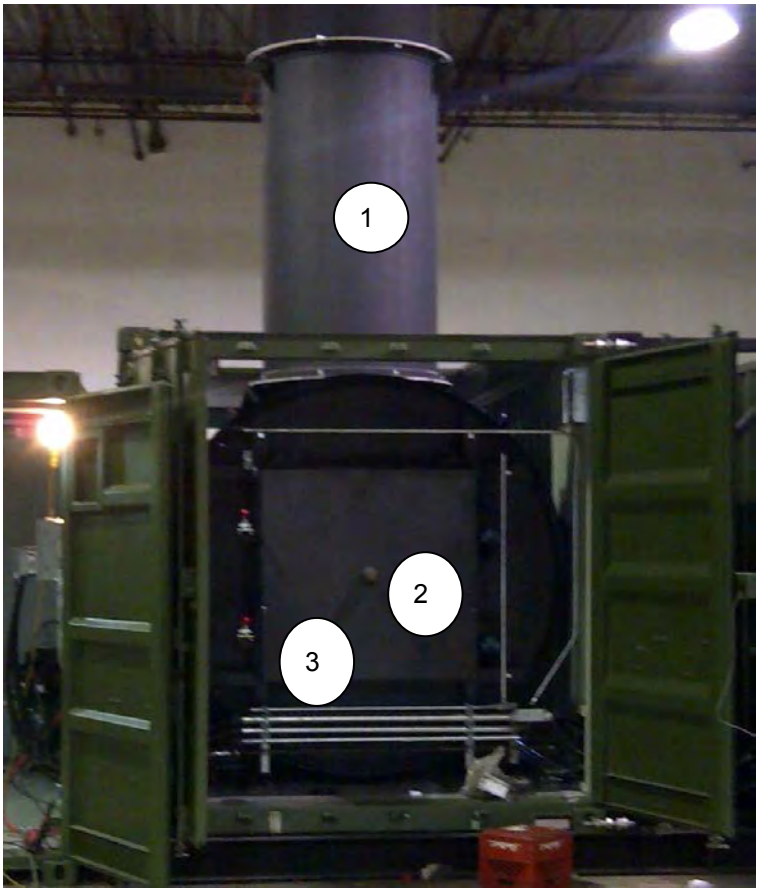
Secondary Chamber Burner (Diesel-fired) is similar to the burner used in the Primary Chamber except that it is a much higher output burner and its output is self-modulated over a broad range for very precise temperature control.

The Secondary Chamber is sized to allow two seconds of retention time. This is the time that the gases from the Primary Chamber are retained in the Secondary Chamber before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the Primary Chamber.



1. Waste Oil Burner
2. Secondary Chamber Blower/Fan
3. Secondary Chamber Burner (Diesel-fired)

Front View: Secondary Chamber Container



1. Stack
2. Secondary Chamber View Port
3. Secondary Chamber Access Door

Sample Rear View: Secondary Chamber Container

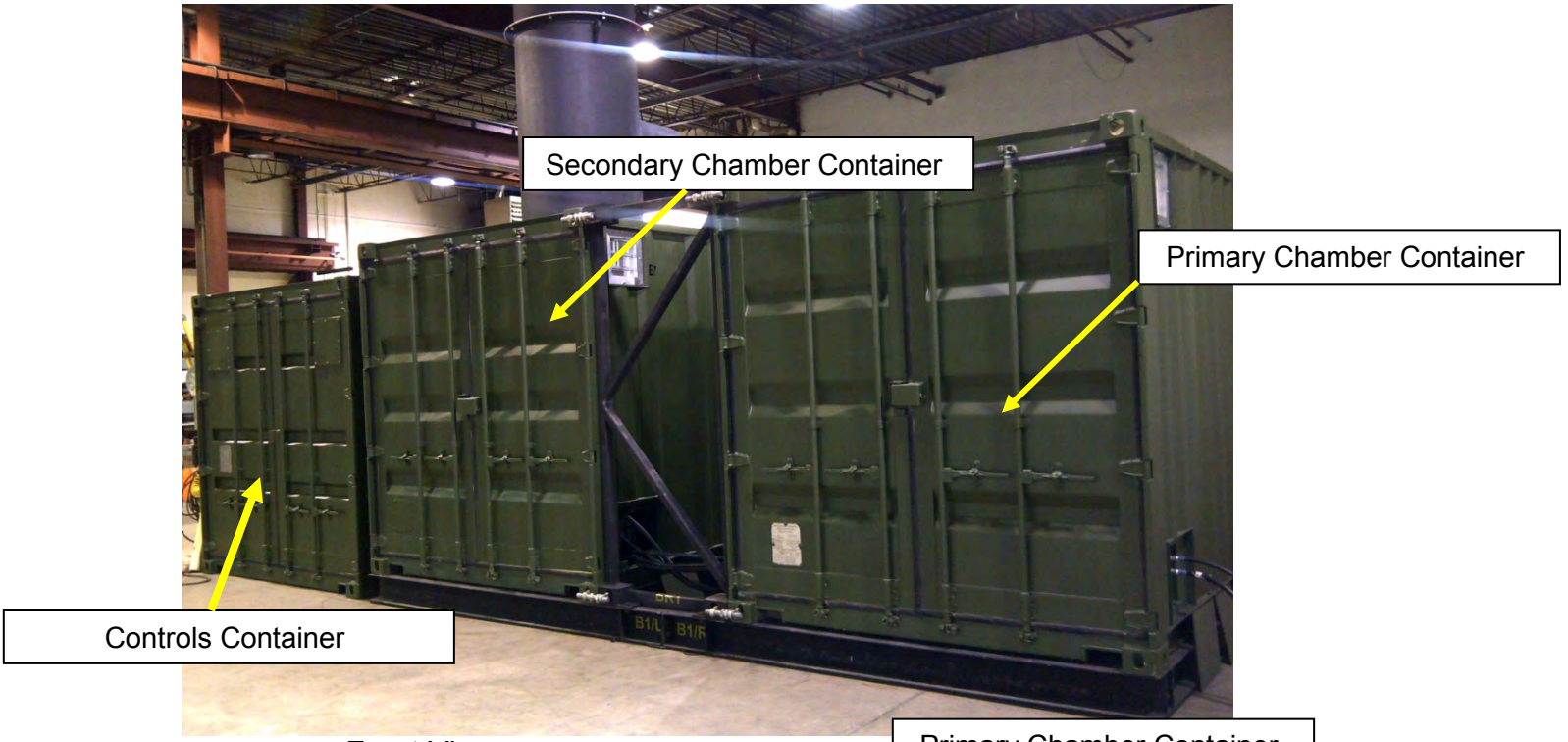
2.1.3.4.3 Main Control Panel

There is one Main Control Panel that controls all of the interconnecting modules. The Operator has one simple interface to start the equipment, view system status and change control settings if required. The entire process is managed using a **PLC** (programmable logic controller) to automate the operation. The critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion.

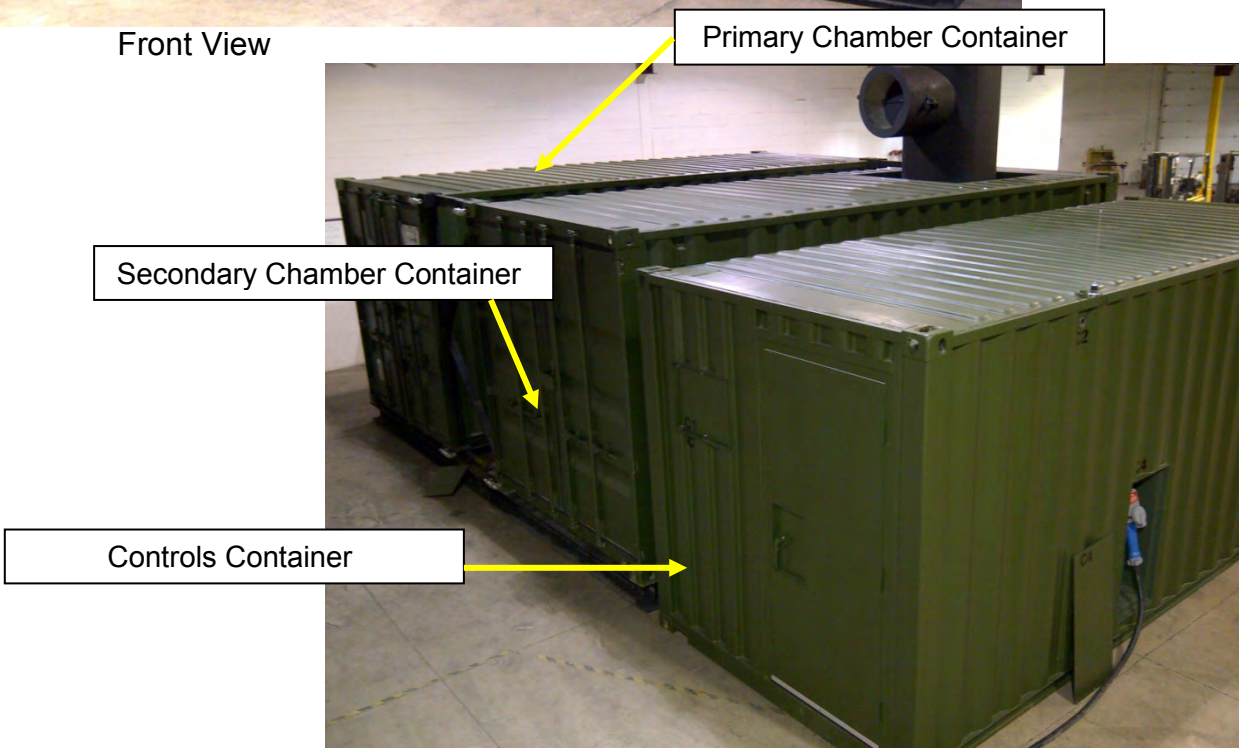
Front View: Main Control Panel

2.2 DESCRIPTION OF EWS MOBILE INCINERATOR

2.2.1 EWS Mobile Incinerator Containers



Front View



Rear View

The **EWS Mobile Incinerator** consists of the following containers as depicted in the drawing.

2.2.1.1 **Primary Chamber Container:** containing the Primary Chamber and diesel oil connectors

2.2.1.2 **Secondary Chamber Container:** containing the Secondary Chamber

2.2.1.3 **Controls Container:** containing the Main Control Panel (Monitoring and Control Centre) as well as the electrical hook-ups and Air Compressor

2.2.1.4 **Shipping Container:** Container to hold components during transportation (Not Shown)

EWS Mobile Incinerator: Description of each Container

2.2.1.1 #1 Primary Chamber Container

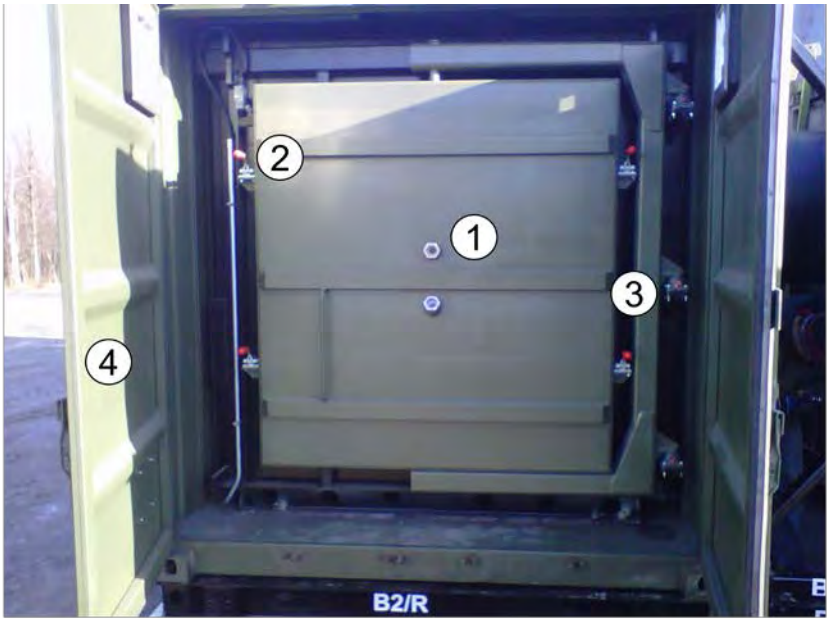
a. This standard 20' ISO shipping container permanently encloses the **Primary Chamber.**

b. At one end of the container the operator can open the container and gain access to the large front-loading primary chamber door. The Primary Chamber door will pivot on its hinge to allow for an opening of 90°.

c. At the other end of the container the doors will allow for unencumbered access to the auxiliary fuel (diesel) burner. Also located at this end is the Primary Chamber cooling fan. Other than during periodic maintenance and installation and disassembly, there is no need to regularly access these components and therefore these doors will be kept closed.
   i. The Primary Chamber including all of its major components and plumbing will be shipped fully assembled within the container, with minimal assembly of interconnections required in the field.

d. This container includes its own air handling system.

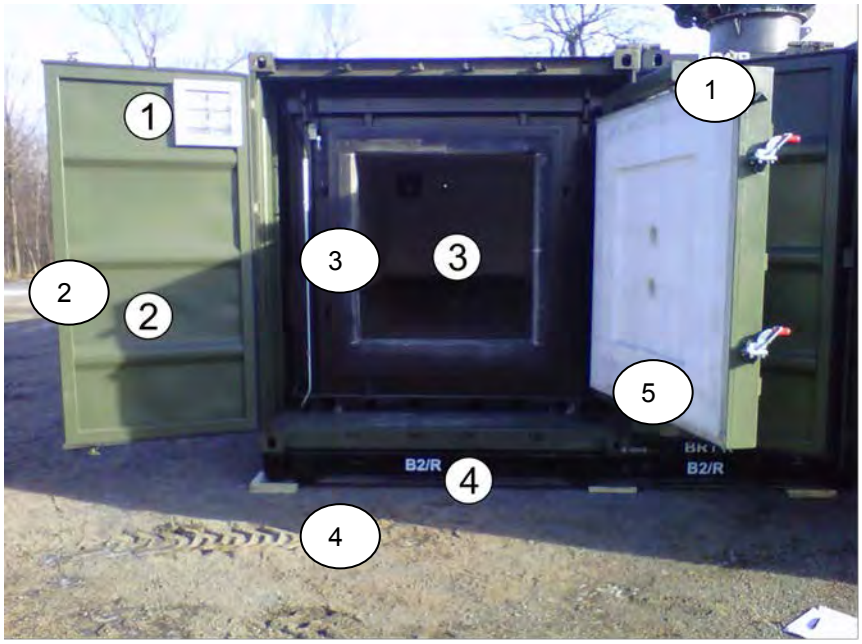
e. This container is modified to allow interconnections to the other containers:
   i. Hatch opening for interconnecting duct Breech between Primary and Secondary Chamber Containers
   ii. Utility Bridge for fuel in, fuel return line out, electrical power in and instrument cables out



1. Primary Chamber View ports (2)
2. Toggle Clamps (4)
3. Door Bearings (3)
4. Primary Chamber Container Door

Front View: Primary Chamber Container

(with Primary Chamber Door Closed)



1. Container Louver
2. Primary Chamber Container Door
3. Opening into Primary Chamber (loading area)
4. Base frame
5. Toggle Clamps

Front View: Primary Chamber Container

(with Primary Chamber Door Open)

1. **Thermocouple**
2. **Burner (Diesel-fired)**
3. **Primary Chamber Blower/Cooling Fan**

Rear View: Primary Chamber Container

2.2.1.2 #2 Secondary Chamber Container

a. This standard 20' ISO shipping container permanently encloses the **Secondary Chamber.**

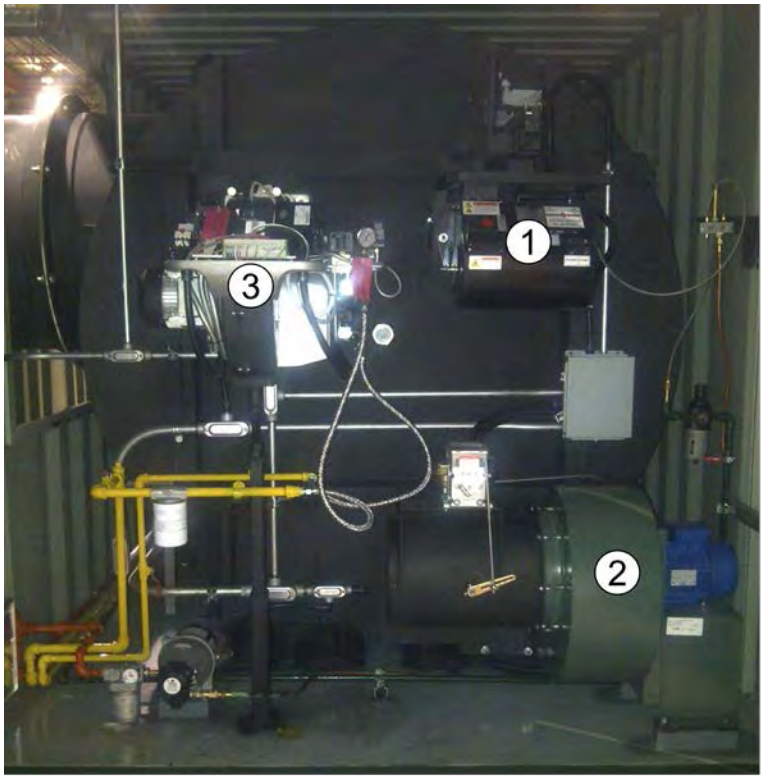
b. This container will be accessed by the Operator on a daily basis. The doors provide access for periodic maintenance and for access during installation and disassembly.

c. The Secondary Chamber including all of its major components and plumbing will be shipped fully assembled within the container, with minimal assembly of interconnections required in the field.

d. The Secondary Chamber includes an access door for inspection and maintenance access for the Secondary Burner

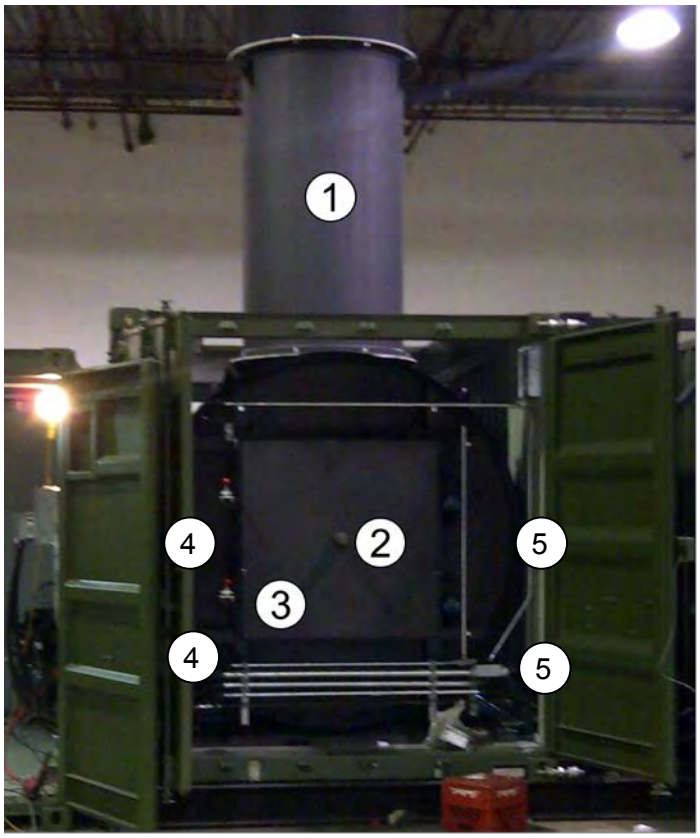
e. This container includes its own air handling system.

f. This container is modified to allow inter connections to the other containers.
   i. Hatch opening for interconnecting duct, Breech between Primary and Secondary Chamber Containers
   ii. Utility Bridge (Secondary Chamber to Primary Chamber) Interface for fuel in, fuel return line out, electrical power in and instrument cables out.
   iii. Utility Bridge (Secondary Chamber to Controls Container) fuel, electrical, instrument and air.



1. Waste Oil Burner
2. Secondary Chamber Blower/Fan
3. Secondary Chamber Burner (Diesel-fired)

Front View: Secondary Chamber Container



1. Stack
2. Secondary Chamber View Port
3. Secondary Chamber Access Door
4. Toggle Clamps (2)
5. Door Bearings

Rear View: Secondary Chamber Container

2.2.1.3 #3 Controls Container

a. This standard 20' ISO shipping container houses the Main Control Panel for the entire **EWS Mobile Incinerator** package.

b. This container will be the main point of operations and control for the entire **EWS Mobile Incinerator** package.

c. This container is modified to allow inter connections to the other containers.
   i. Utility Bridge Interface with Secondary Chamber, fuel, electrical, instrument and air.
   ii. Main power supply connection

1. Main Power Supply Connection 2" (power supply cable and coupling to be supplied by customer)

2. Control Room Door

2.3 SPECIFICATIONS & MATERIALS OF CONSTRUCTION

2.3.1 EWS Mobile Incinerator: Operating Parameters

Operational Parameter	Rating
Incinerator Type	Controlled-air, two-stage
Fuel Type	Main: Diesel; Auxiliary: Waste Oil
Waste load capacity	2000 kg
Batch cycle time	8-10 hours estimate
Factory Pre-set minimum burn time	480 minutes
Cool down cycle	10-12 hours
Pre-set automated cool down cycle operation time	720 minutes

2.3.2 EWS Mobile Incinerator: Technical Specifications

2.3.2.1 Incinerator: Materials of Construction

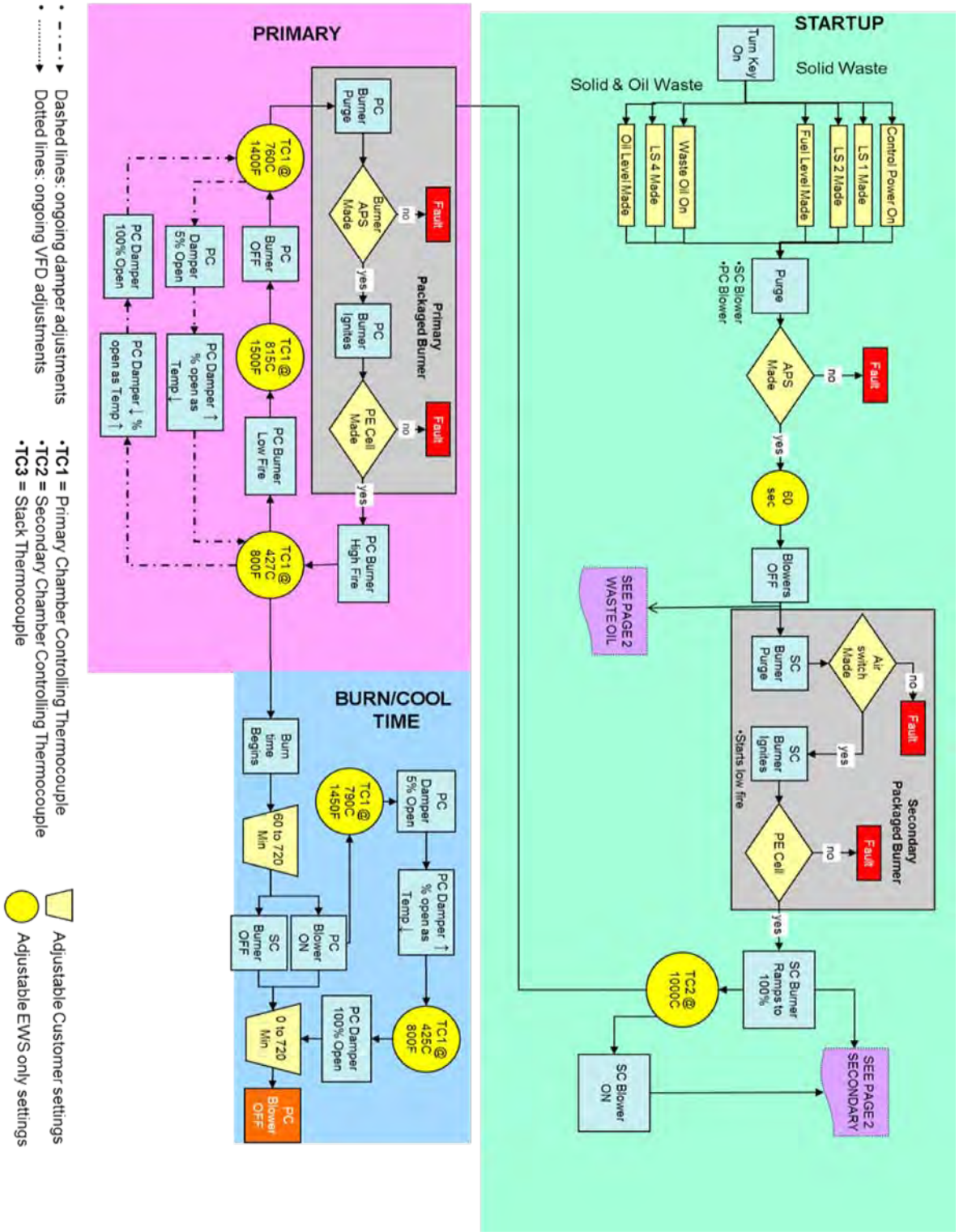
Component	Material of Construction
Incinerator Shell	¼" thick mild steel, welded with continuous bead welds Sand-blasted and painted with rust-inhibiting, high temperature paint
Incinerator Lining – Primary Chamber Floor	Factory cured, reinforced castable monolithic refractory, 6" thick Rated to 1760°C
Incinerator Lining – Primary Chamber walls and roof, Secondary Chamber interior	Ceramic fibre modules, 6" thick Rated to 1200°C Modules are lightweight and are individually anchored to the shell (Heavy, high-strength material not required or desirable in these areas) Highly reflective, does not retain heat against shell Immune to thermal shock from temperature cycling inherent in batch operation
Incinerator Lining – Door jambs, lintels, breech openings, and other penetrations	Factory cured, formed, reinforced castable refractory, 6" thick Rated to 1200°C High-strength, erosion and abrasion resistant material required in the susceptible areas
Fuel Oil Tanks (Diesel & Waste Oil)	Mild steel tank, sand-blasted and coated with corrosion resistant paint. Double-wall construction.

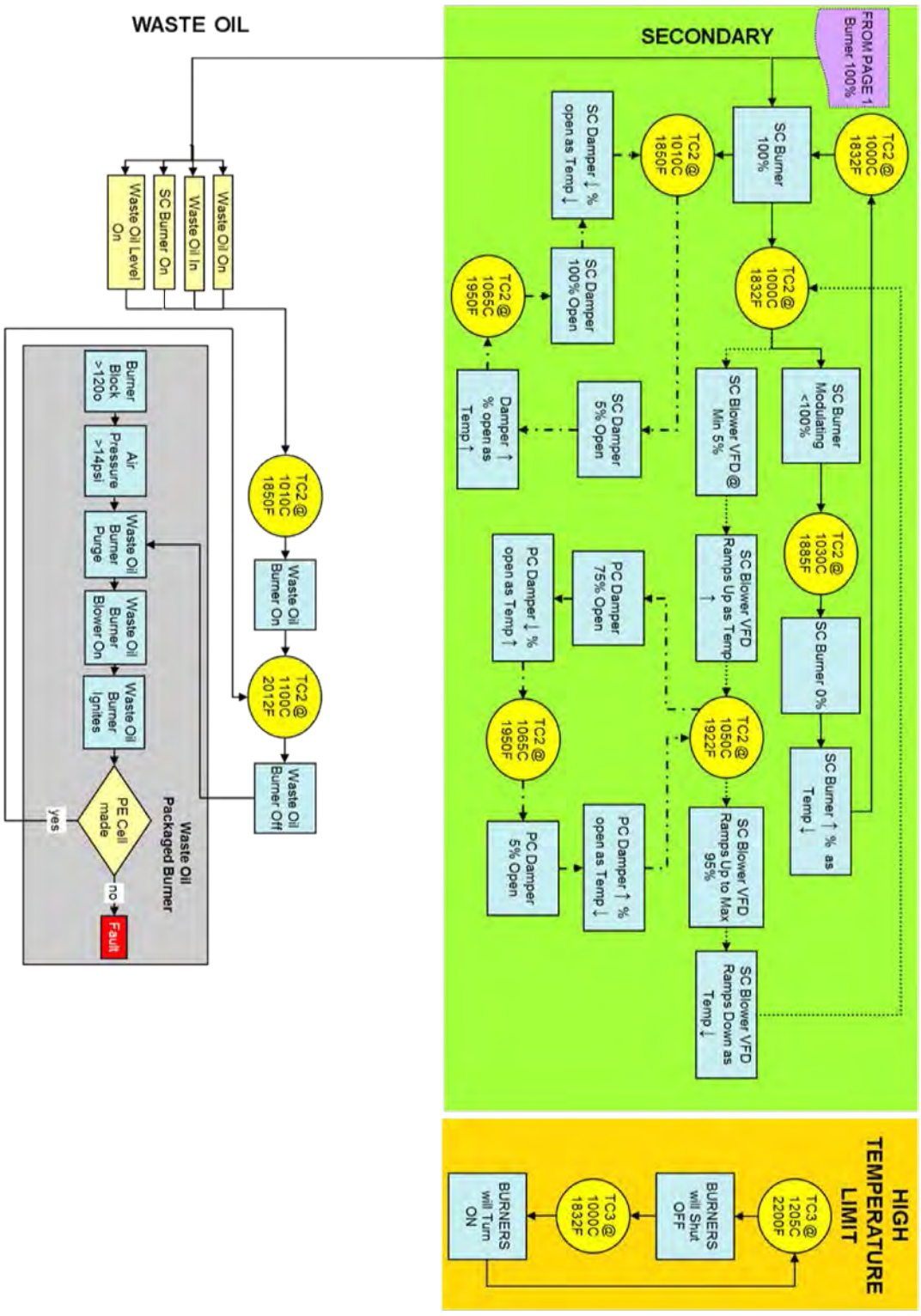
2.3.2.2 Incinerator: Major Components Specifications

Component	Description	Size/Rating
Control System	Single main control cabinet houses all motor starters, breakers and overloads. PLC process controller, Variable Frequency Drive (VFDs) to control Secondary Blower. LCD Operator Interface.	Electrical Power Design Input: 600V, 60 A
Packaged Diesel Fired Burners	Industrial burners each with built-in blower to supply combustion air, oil pump driven by same motor. Burner complete with integral relief valve and filter, fuel pressure gauge, air proving switch and igniters.	Primary Burner Rating: 97/154-395 kW **Motor: 0.7 kW** Secondary Burner Rating: 332/711-1482 kW **Motor: 2.1 kW**
Blowers	Factory run tested packaged design. Fan construction able to withstand high heat environment.	Primary Blower: Flow rate:1700 m^3/h Standard Static Pressure (SP): 31.5 mmH_2O **Motor: 1.12 kW (1.5 HP)** Secondary Blower: Flow Rate:4247 m^3/h Standard SP: 61 mmH_2O **Motor: 1.5 kW (2 HP)** Note: Standard Air, 70°F, 0.075IB/CF (21°C, 1.20 kg/m^3)
Diesel Fuel Tank	Includes all required accessories: vent, drain, level sensor and lifting lugs.	Volume: 2200 litres
Waste Oil Tank	Includes all required accessories: vent, drain, level sensors, heater and lifting lugs.	Volume: 500 litres

2.3.3 EWS Mobile Incinerator: Controls Philosophy

2.3.3.1 EWS Mobile Incinerator Package Central Control System




WASTE OIL
SECONDARY
FROM PAGE 1 Burner 100%
TC2 @ 1000C 1832F
SC Burner 100%
TC2 @ 1010C 1850F
SC Damper ↓ % open as Temp ↓
TC2 @ 1065C 1950F
SC Damper 100% Open
TC2 @ 1000C 1832F
SC Blower VFD @ Min 5%
SC Burner Modulating <100%
Damper ↑ % open as Temp ↑
SC Damper 5% Open
TC2 @ 1030C 1885F
SC Blower VFD Ramps Up as Temp ↑
SC Burner 0%
PC Damper ↓ % open as Temp ↑
PC Damper 75% Open
TC2 @ 1050C 1922F
SC Burner ↑ % as Temp ↓
TC2 @ 1065C 1950F
SC Blower VFD Ramps Up to Max 95%
PC Damper 5% Open
PC Damper ↑ % open as Temp ↓
SC Blower VFD Ramps Down as Temp ↓
HIGH TEMPERATURE LIMIT
TC3 @ 1205C 2200F
BURNERS will Shut OFF
TC3 @ 1000C 1832F
BURNERS will Turn ON
Waste Oil Level On
SC Burner On
Waste Oil In
Waste Oil On
TC2 @ 1010C 1850F
Waste Oil Burner On
TC2 @ 1100C 2012F
Waste Oil Burner Off
Waste Oil Packaged Burner
Burner Block >120o
Air Pressure >14psi
Waste Oil Burner Purge
Waste Oil Burner Blower On
Waste Oil Burner Ignites
PE Cell made
yes
no
Fault

2.4 WASTE PROCESSING CAPABILITIES

2.4.1 EWS Mobile Incinerator Waste Description

The waste types to be processed include: personal domestic waste, kitchen waste, dewatered sewage sludge, paper, packaging, lumber and textiles, documents, occasional tires and clinical medical waste (only gauze and needles). Furthermore, the specification indicates that hazardous materials including batteries will be eliminated from the incinerator waste stream.

2.4.2 Design Waste Assumptions

Quantity	**2000 kg/day**
Density	**160-240 kg/m^3**
Higher Heat Value	**15,150 KJ/kg**
Moisture Content	**Up to 40%**

System capacity of 2000 kg per day is based on the above waste mix assumptions. Waste will be loose, as received and not compacted prior to loading. If high volumes of PET (clear plastic) water bottles are received some compaction is recommended to ensure that the waste mix characteristics are representative of materials presented in the quote AMR-ECO M 2TN.

NOTA

2.4.2.1 Higher heat value materials should be mixed with lower heat value materials to ensure that the average heat value of the batch load is approximately that listed above. Overloading the system with high heat value materials can cause uncontrolled combustion leading to pollution and/or damage to the incinerator system.

2.4.2.2 A batch system capacity is closely related to the waste density. If a large amount of very low density, low weight materials are loaded into the system at one time the volume of the Primary Chamber may limit the capacity to much less than it is rated for. Care should be taken to mix waste materials to ensure the correct density range. Also, materials containing large air spaces such as empty plastic bottles, and cardboard boxes should be flattened before loading.

2.4.2.3 When processing batches of very wet materials the burn cycle time should be increased to accommodate the additional time required to dry the waste before it can combust.

2.4.2.4 Do not load the system with more than 25% by volume of extremely wet materials such as grey water or wet garbage.

2.4.2.5 When possible layer the materials so that the load is a mix of wet and dry, and/or high and low heat value materials.

2.4.2.6 Never load more than approximately 20 litres of high heat value waste such as kitchen grease or used cooking oil as this can lead to an uncontrolled burn.

2.4.2.7 See the list in Section 2.4.4 "Unacceptable Waste Materials" for items that should not be processed in the **EWS Mobile Incinerator**.

2.4.3 Waste Materials Suitable for Processing

Waste Materials Suitable for Processing in the EWS Mobile Incinerator

The following table is a generic description of waste materials that can be processed effectively using this equipment.

Solid Waste	Description	Origin
Food Waste	Food, food packaging and containers, plastic and paper waste from food preparation	Kitchen and dining areas
Domestic waste	General refuse such as paper, plastics, cans, bottles, cardboard, newsprint	Dormitory areas, recreation facilities, office areas, warehouse, plant and production facilities
Packaging	Cardboard boxes, paper, plastic containers, plastic film, styrofoam, poly-weave bags	Inbound supplies to all work areas
Wood waste	Skids, pallets, crates	Construction activity, inbound supplies
Absorbents	Rags, wipes, spill cleanup materials	From all work areas
Filters – Air and Fluid	Filters coated with fine particles and trapped solids, saturated with water or fluids (glycol, lube oils, fuel)	From water treatment facility, or generated at point of maintenance of vehicles, machinery and equipment
Clinical Waste	Bandages, dressings, gloves, swabs, syringes, sharps	Medical clinic or first aid centre
Tires & Rubbers	Tires (only 1 at a time), belts, hoses	From vehicles and equipment maintenance shop
Semi-solid Waste	Description	Origin
Kitchen grease, oils	Solid kitchen fats, grease, used cooking oil in small pails (maximum volume 10 litres per burn)	Kitchen grease traps, fryers

2.4.4 Waste Materials NOT Suitable for Processing

Unacceptable Waste Materials

Waste Type	Examples
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils
Radioactive Materials	Smoke detectors, laboratory wastes
Potentially Explosive Materials	Pressurized vessels including, but not limited to propane tanks, aerosol cans (deodorant, shaving, cleaning, etc) and the like. Actual explosives.
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels.
Solvents	Solvents such as acetone, xylene, methanol

NOTA

All materials of these types are strictly forbidden from processing. It is very important that all materials in these categories are diverted away from the incinerator in-feed. The examples provided are not an exhaustive list of all possible forms of these waste types.

A waste and procurement audit is highly recommended and encouraged to ensure that all sources of heavy metals (especially mercury) are identified and diverted from the incinerator.

2.5 REGULATORY COMPLIANCE

2.5.1 Environmental Regulatory Compliance

The Mobile Incinerator Package is required to operate with air emissions that comply with the regulations as set out by the CCME Canada Wide Standard for Dioxin and Furans.

EWS guarantees compliance of the **EWS Mobile Incinerator** with the stated limits in the CCME Canada Wide Standard for Dioxin and Furans, subject to the conditions outlined below (see Performance Criteria Conditions).

3.0 ASSEMBLY & INSTALLATION INSTRUCTIONS

3.1 GENERAL ASSEMBLY & INSTALLATION INFORMATION

The **EWS Mobile Incinerator** is largely assembled with interconnections and external components to be mounted as required.

3.1.1 Customer Responsibility

3.1.1.1 Provide all foundation work of concrete blocks for the ends of the containers and packed gravel under the frame and tanks

NOTA

a. **Fuel tanks should be out of the way and protected using bollards against accidental impact of mobile equipment (e.g. trucks, etc.)**

b. Foundation requirements between pads to be determined by customer

c. Specific locations to be determined by customer and site restrictions

3.1.1.2 Install I-beams, spacers and equipment using a crane, forklift, come-alongs, hydraulic jacks/hand-pumps, etc.

3.1.1.3 Provide all utility services including connections to the equipment including fuel, electrical, water, air, etc. using basic hand tools.

3.1.1.4 Provide all external thermal insulation and heat tracing when required on incoming and outgoing utilities.

3.1.1.5 Provide proper protection of all equipment from accidental damage or vandalism (bollards, exterior lighting, etc).

3.1.1.6 Perform any touch up painting and cleanup of equipment after assembly.

3.1.1.7 Locate the fuel tank at the specified distances to ensure maximum positive supply pressure on the suction side.

3.1.1.8 Obtain any and all construction, operating and environmental permits and other approvals as may be required in the area of jurisdiction where the equipment is being deployed and operated. EWS will assist in supplying technical information required for these permits to the customer as it relates to EWS equipment.

3.1.1.9 Maintain ample space around all equipment for maintenance, cleaning and safety considerations. A suggested provision would be to provide a minimum of 1.83 meters from all major equipment surfaces and edges. Always allow proper space for the swing radius of the chamber doors including vehicular traffic.

NOTA

Do not scale drawings: If certain dimensions are required which are not shown on drawings, EWS should be contacted for the required dimension. EWS will not be

responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction, assembly and/or erection, unless so indicated.

Please note that some of the diagrams and/or photos in this MANUAL are conceptual in nature and may not be exact representations of the equipment purchased.

3.1.2 Preparation Prior to Assembly & Installation

3.1.2.1 Electrical & Fuel Availability

The electrical supply must be the Canadian supply of 600 V 60 Hz, 3 phases. There is one main electrical hook-up opening 2" located on the side of the Controls Container. All electrical connections are distributed from the Controls Container to the Primary Chamber Container and the Secondary Chamber Container.

DO NOT CONNECT THE EXTERNAL POWER SUPPLY TO THE EWS MOBILE INCINERATOR UNTIL ALL INTERNAL ELECTRICAL CONNECTIONS ARE COMPLETE AND THE SYSTEM IS COMPLETELY ASSEMBLED.

The fuel supply connections are located on the Primary Chamber Container and connect the fuel supply to the fuel tank located externally. There are fuel lines between the containers for fuel distribution which are to be connected before the external hook-ups and connections are made.

DO NOT CONNECT THE EXTERNAL FUEL SUPPLY TO THE EWS MOBILE INCINERATOR UNTIL ALL INTERNAL FUEL CONNECTIONS ARE COMPLETE AND THE SYSTEM IS COMPLETELY ASSEMBLED.

3.1.3 Assembly & Installation Overview

3.1.3.1 Specialized Tools and Equipment for Assembly and Installation

The complete assembly of the **EWS Mobile Incinerator** will require 2-3 full time personnel for 2 days. The following list identifies the tools and equipment required to be supplied by the customer in order to proceed with the assembly:

a. Crane
b. Forklift
c. Boom Lift, Scissor Lift and/or Scaffolding
d. Steel Shims
e. Ladder (12')
f. Come-along
g. Hydraulic Jack/pump
h. Level
i. Erection Wrench / Alignment bar
j. Container Clamp 2"-Wrench

k. Sling
l. I-beam Clamp

The following list identifies the consumable items to proceed with the assembly:

a. Anti-Seize Compound (Generic Graphite-Based Anti-Seize Compound)
b. Gasket Spray-on Adhesive (Generic Spray-On Contact Cement)

3.1.3.2 Assembly Overview

The following general steps are the order in which the **EWS Mobile Incinerator** Package needs to be installed. Each step is detailed in the subsequent section.

ORDER OF ASSEMBLY (and detailed in Section 3.1.4)

1) I-Beam & Spacer Base Structure (Base Frame Structure)
2) Connections Between Primary and Secondary Chamber Containers
3) T-Stack Section on Secondary Chamber Container
4) Stacks and opacity monitor
5) Internal Component Connections
6) Internal Connections
7) External Connections

NOTA

Important Notes to Consider Prior to and During Assembly

a. Lifting lugs are provided on the stacks, and major accessories, and should be used in setting these units into position.

b. Do not allow lifting chains or cables to put loads on piping, or mounting flanges as they may be damaged.

c. Avoid dragging lifting gear across painted surfaces.

d. When placing the system into position, be careful not to subject the refractory to mechanical shock, which may result in refractory damage.

3.1.4 Assembly Instructions

3.1.4.1 I-BEAM & SPACER BASE STRUCTURE (Base Frame Structure)

NOTA

For <u>all</u> fasteners used in assembly use regular-grade anti-seize spray to ensure that fasteners will be easily removed when disassembly is required.

NOTA

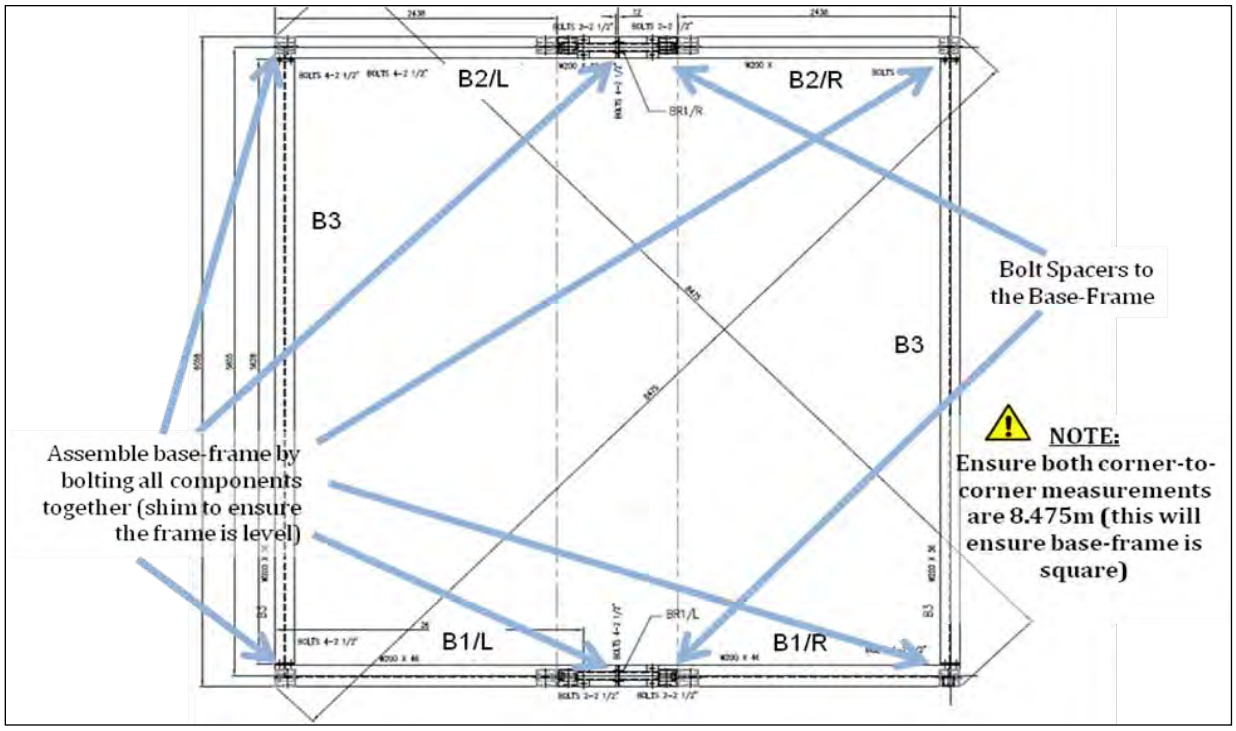
Do not fully torque bolts during initial assembly.

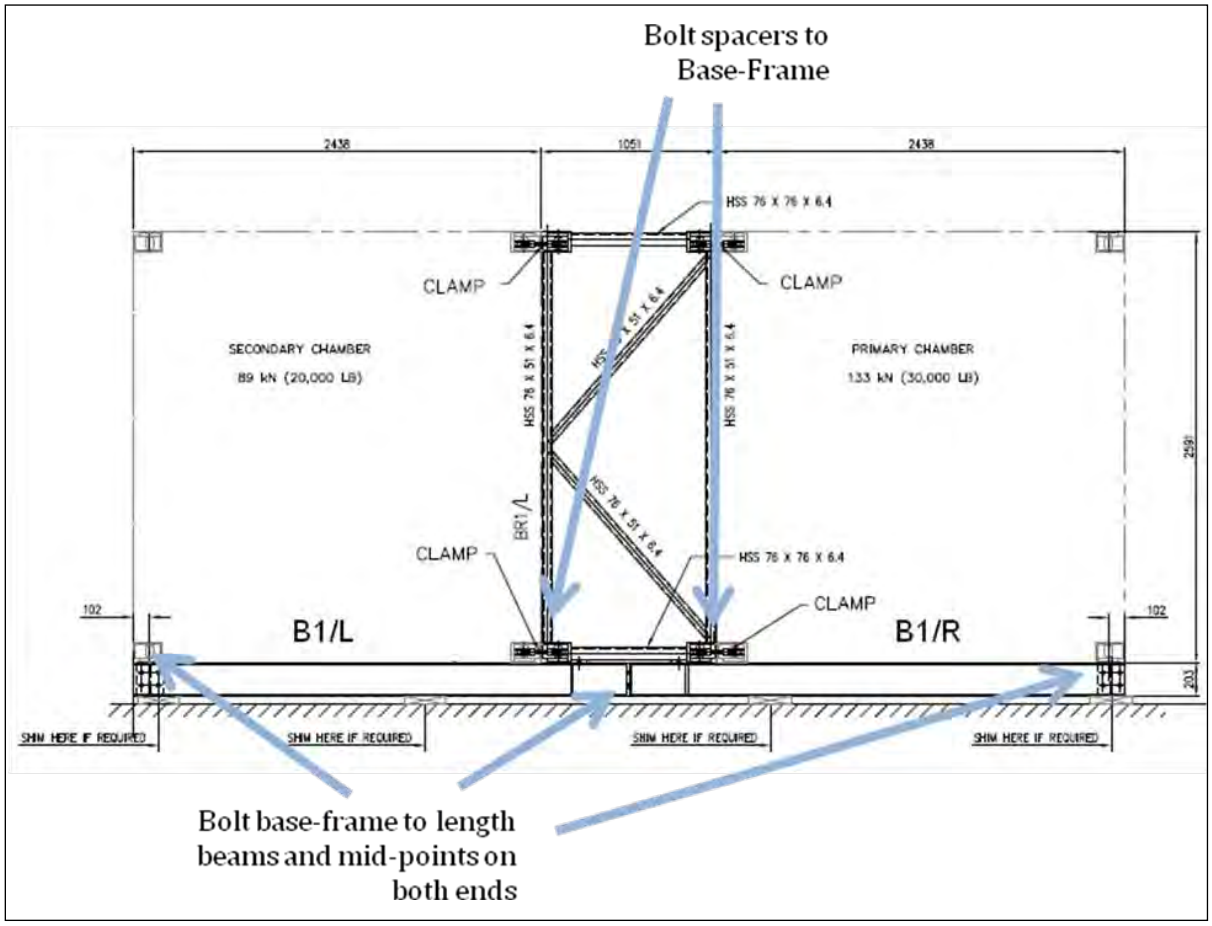
<u>Correct Clamp Installation</u>

When installing the clamps, install in such a manner that the installer pulls back on the

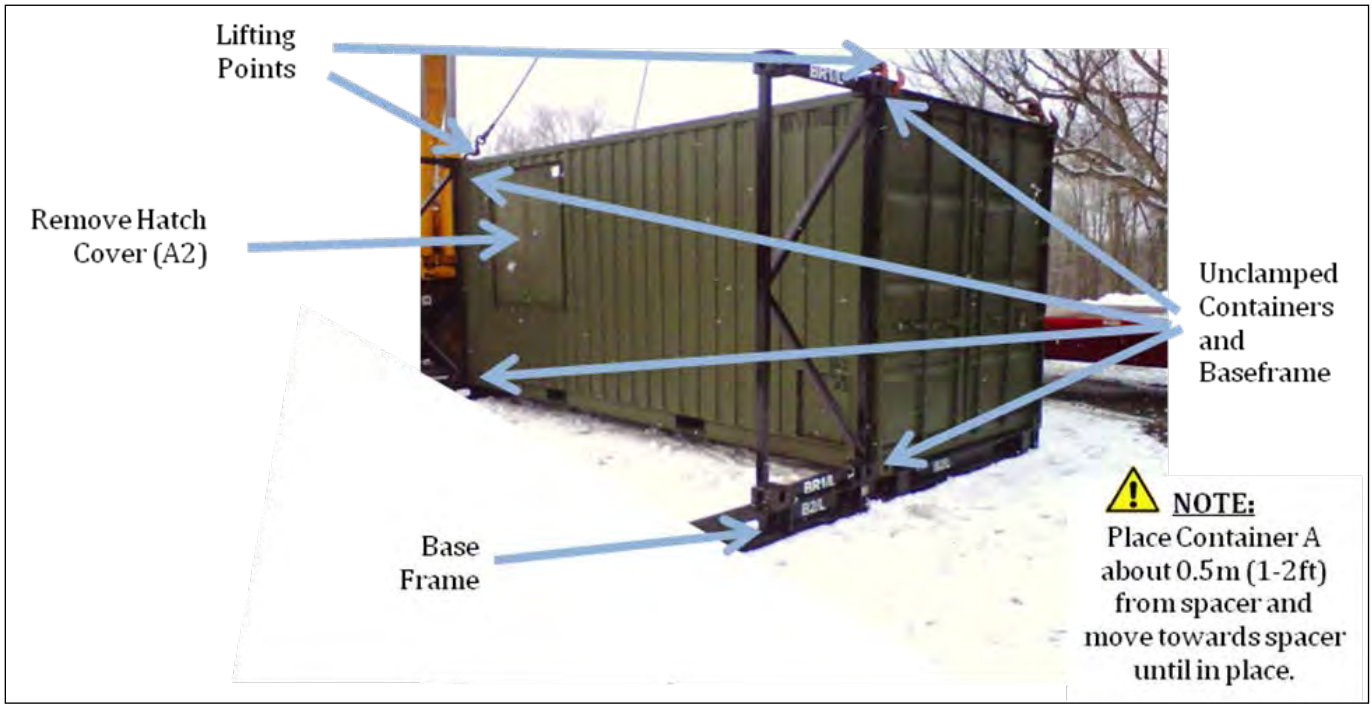
wrench when tightening the clamp. From the installer's perspective, the smaller nut would then be located on the right of the large nut. If it is installed the other way, or during removal, a lift-truck or other lifting device will need to be employed for safety reasons.

Failure to follow the above instructions poses a safety hazard to an installer situated on top of the Primary Container as they would need to push forward to tighten or loosen the clamp.



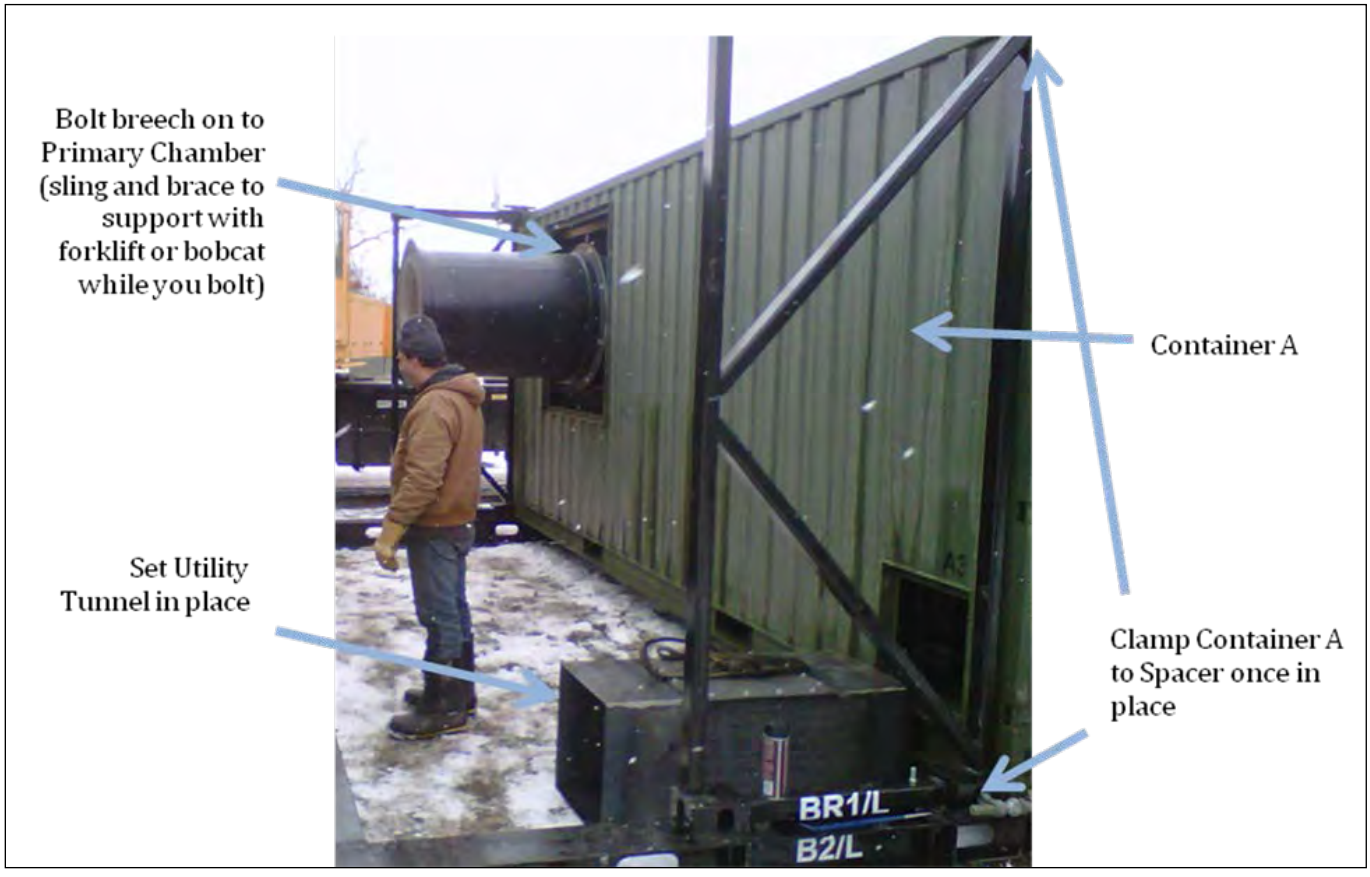


3.1.4.2 CONNECTIONS BETWEEN PRIMARY AND SECONDARY CHAMBER CONTAINERS



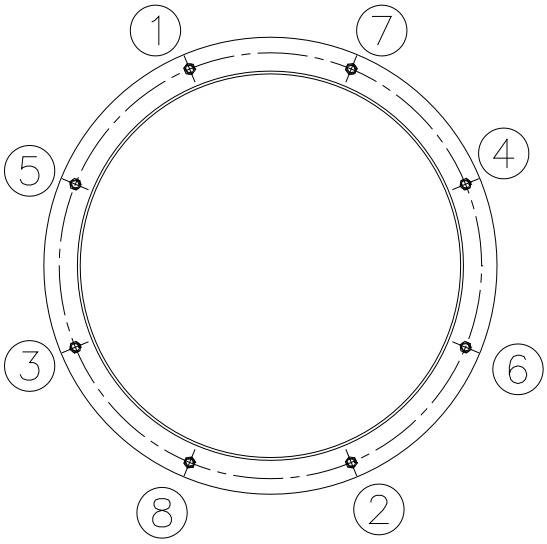
Gasket adhesive spray being applied

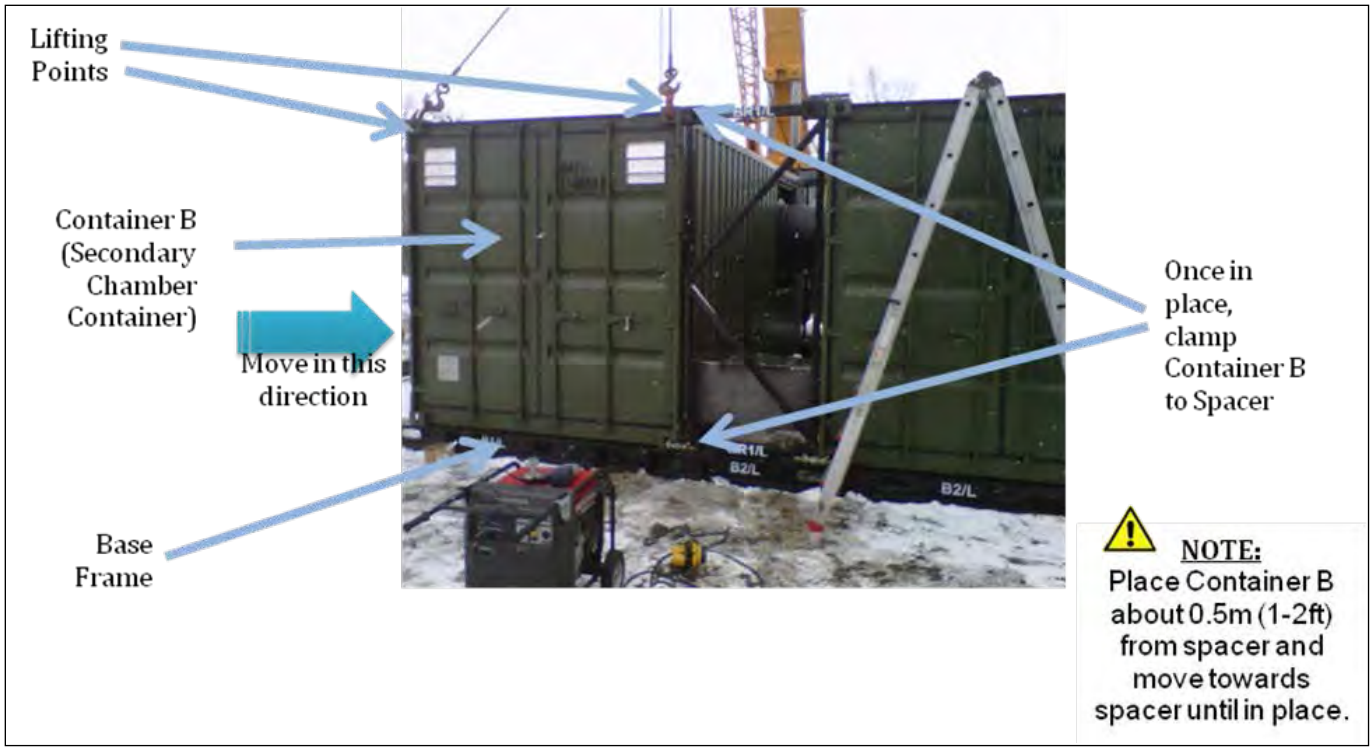
Correctly Installed Gasket

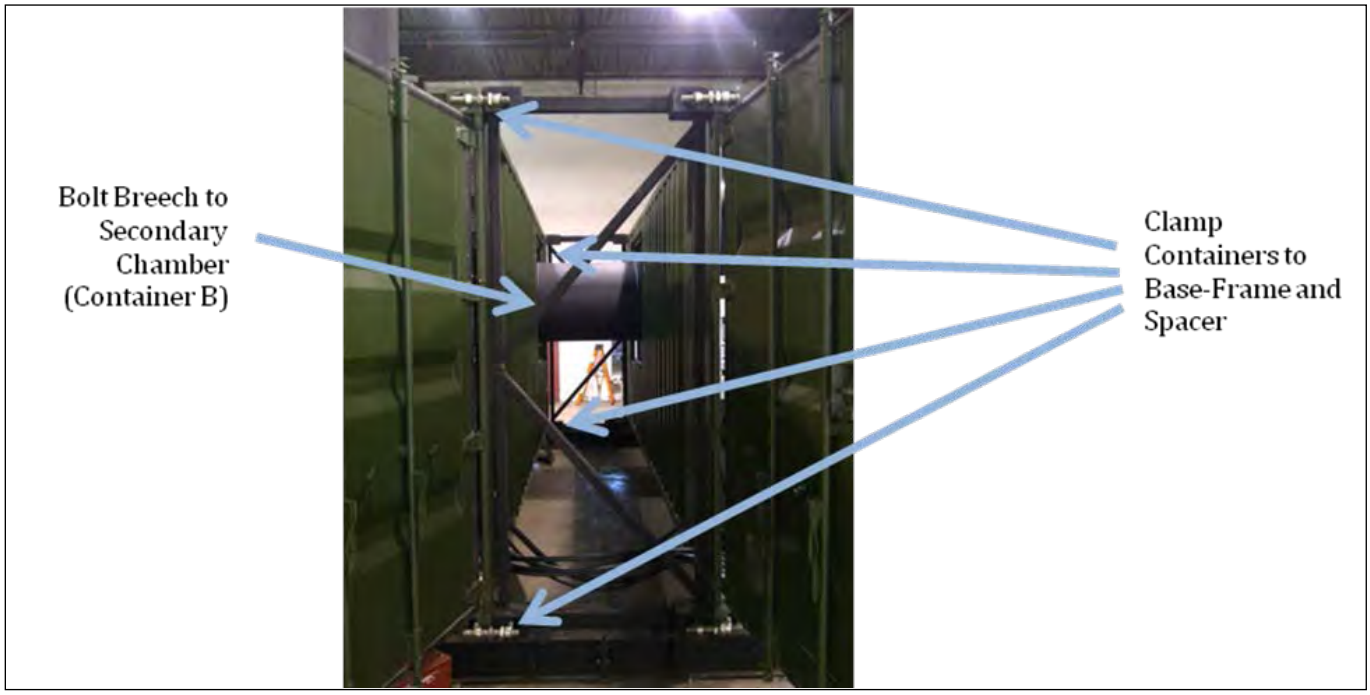


NOTA

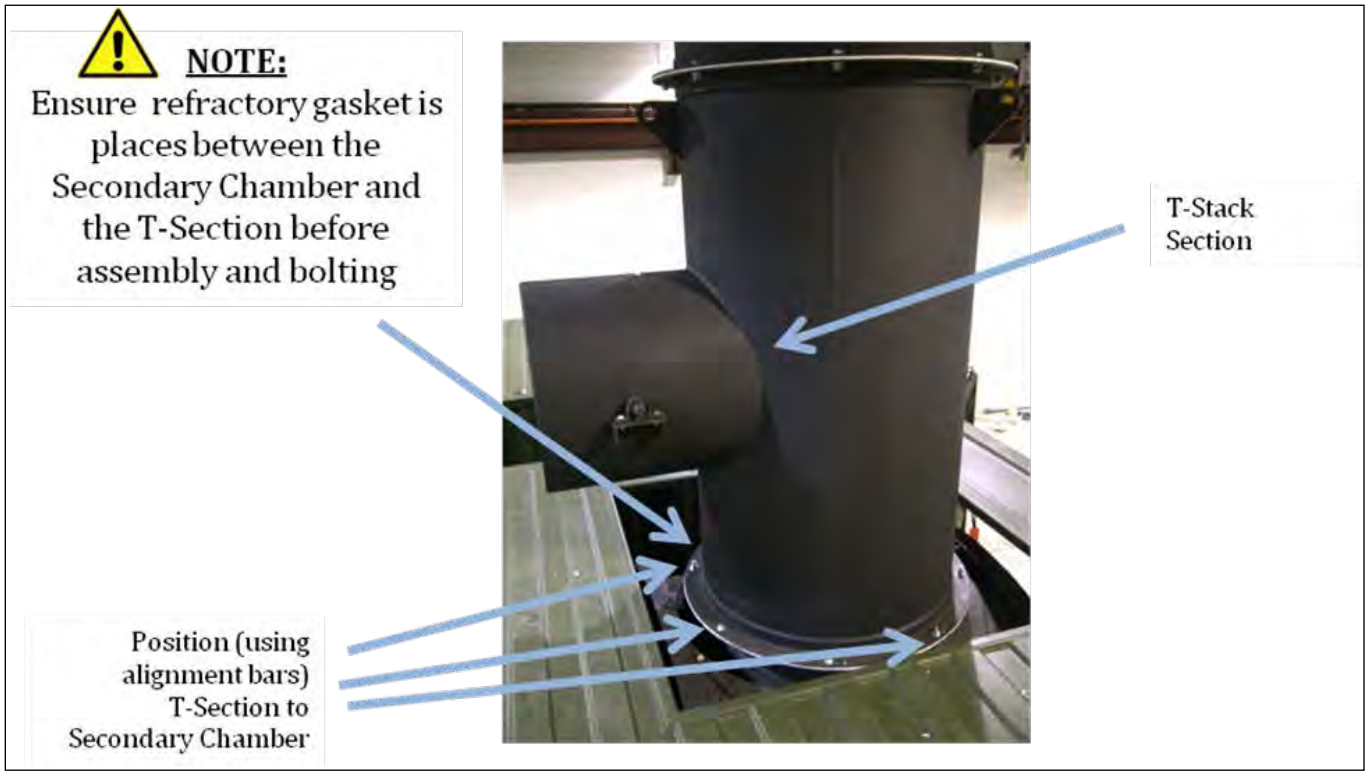
Once breech flanges are aligned and together bolt flanges together using the numerical order described in the pattern below.

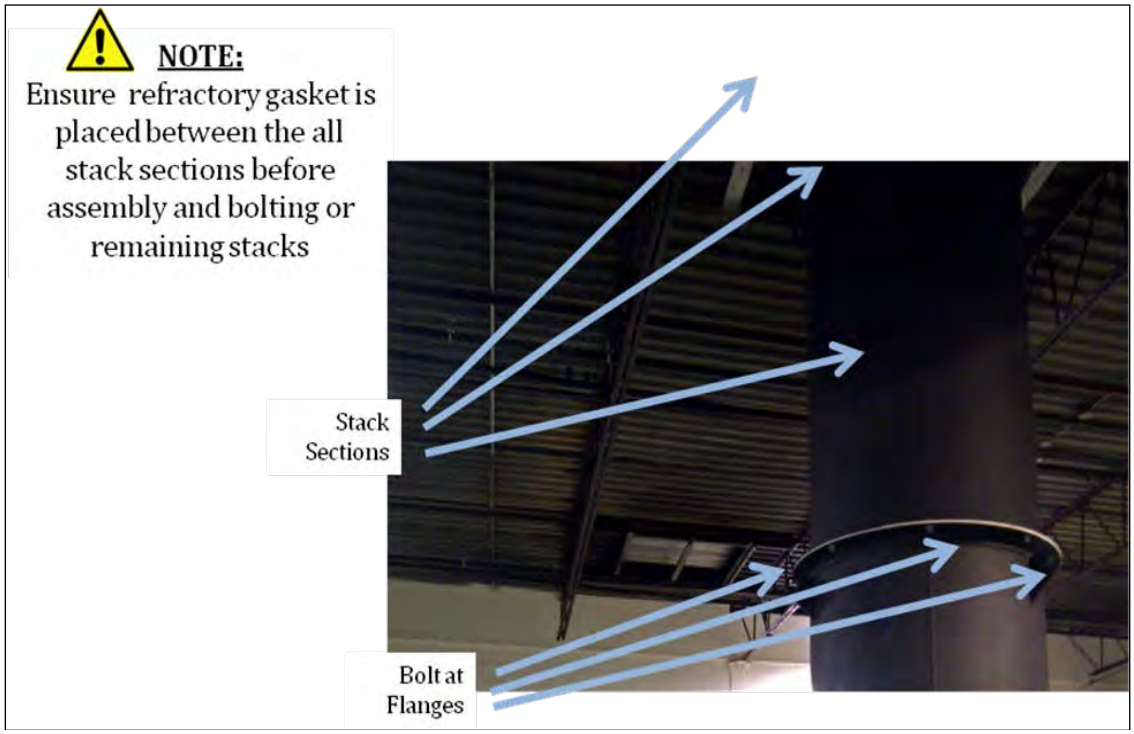

1
7
5
4
3
6
8
2


Lifting Points
Container B (Secondary Chamber Container)
Move in this direction
Base Frame
Once in place, clamp Container B to Spacer
NOTE:
Place Container B about 0.5m (1-2ft) from spacer and move towards spacer until in place.



3.1.4.3 T-STACK SECTION AND SECONDARY CHAMBER CONTAINER





NOTA

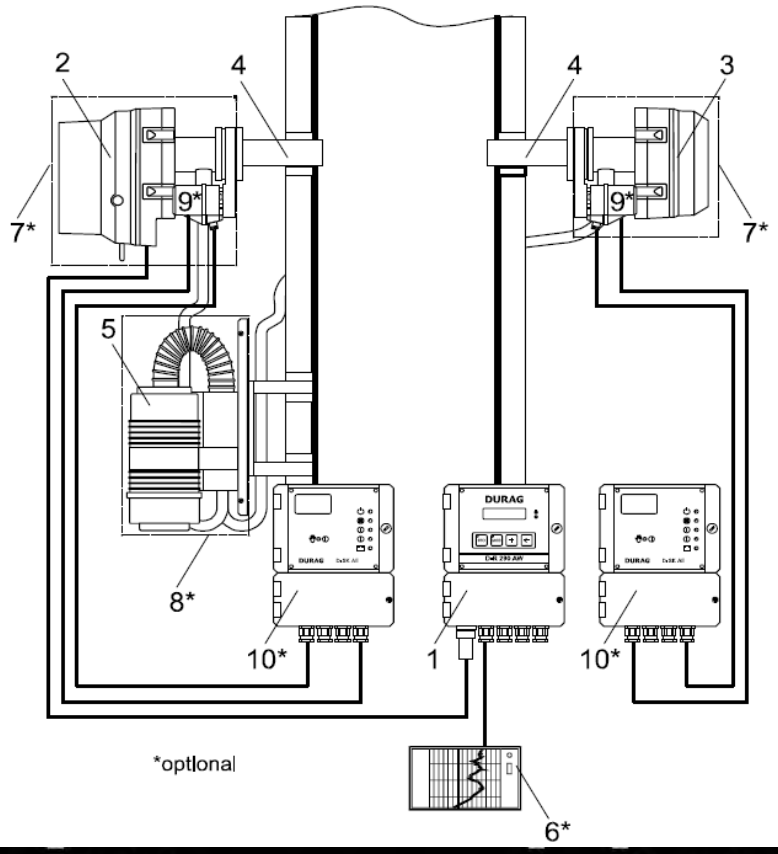
One of the washers must be a lock washer.

3.1.4.4 OPACITY MONITOR

The sensors and purge air unit of the opacity monitor are shipped unassembled and in boxes.

The sensor's mounting flanges are pre-installed in the stack section and the bracket for the purge air unit are installed in the T –stack.

The Control Unit D-R 290 AW is installed inside the Secondary chamber container and pre-wired to the PLC



	Standard		* Optional
1	Control unit, D-R 290 AZ (stack display) Or D-R 290 AW (evaluation unit)	6	Customer supplied recorder or data logging system
2	Transceiver, D-R 290 MK	7 & 8	Weather Hood, US built systems use one
3	Reflector, D-R 290 R1 or R2		Large weather hood for blower and optics
4	Mounting flange, D-R 280 E	9	Fail-safe shutters
5	Purge air unit	10	Fail-safe shutter control electronics

Install the Transceiver and Reflector in the flanges provided in the stack section

Install the Purge Air Unit in the bracket provided in the T-Stack

Connect the Transceiver to the Control unit

Connect power to the Purge Air Unit

3.1.4.5 INTERNAL COMPONENT CONNECTIONS

Flexible conduit in Container 2 (secondary chamber)

Feed flexible conduit from container 2 to containers 1 and 3 through the openings connecting the containers

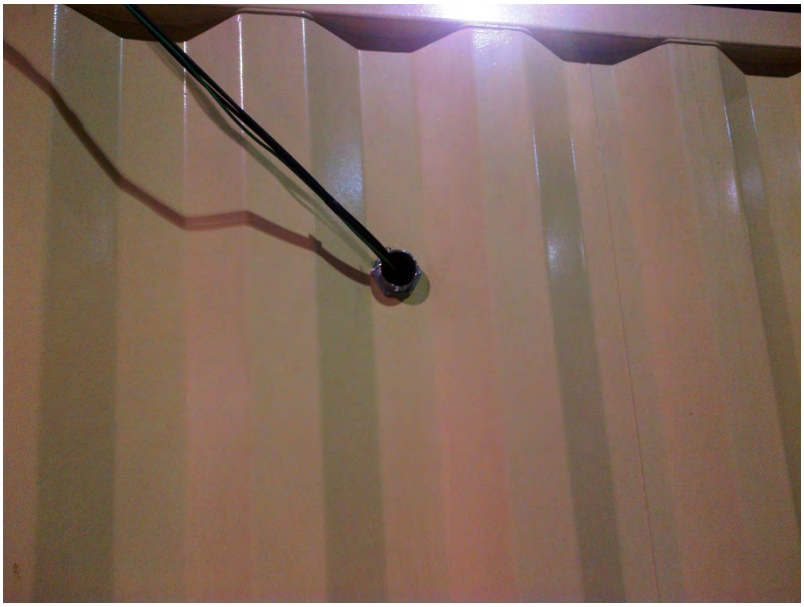
Junction Boxes in container 3 (control container)

Connect each flexible conduit to the correspondent Junction Box (i.e. JB1 conduit with JB1 box) wire the terminal block inside the junction box following the labels on both the wires and the terminal block

Junction Boxes in container 1 (primary chamber)

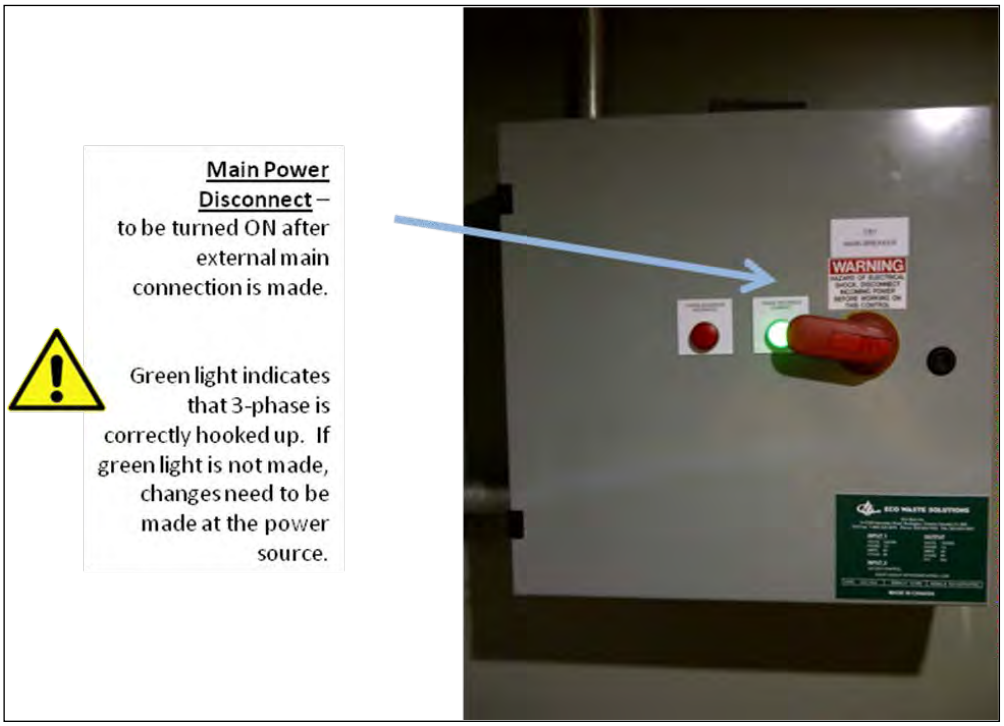
Complete all Junction boxes in both Container 3 and Container 1

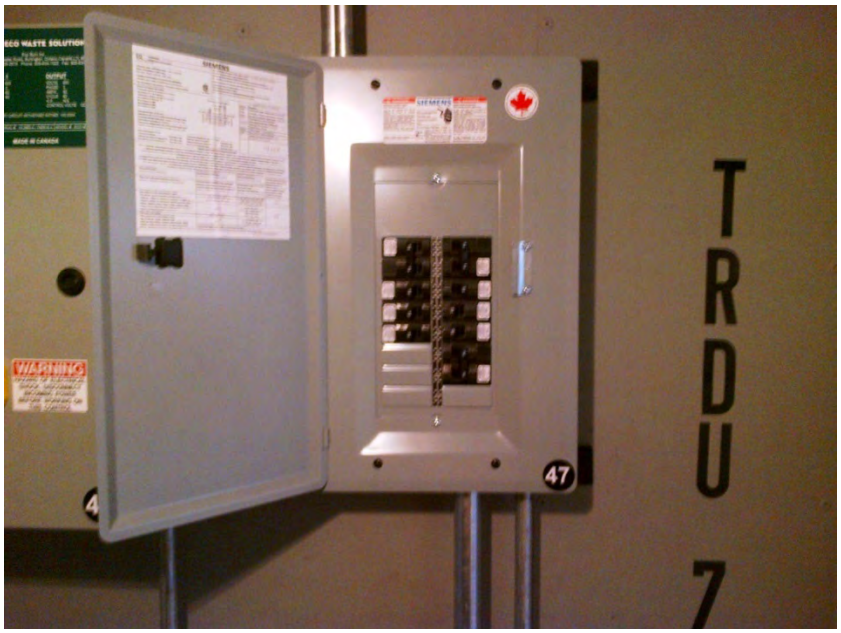
DO NOT CONNECT THE ELECTRICAL UNLESS THE MAIN SUPPLY FROM THE SITE HAS BEEN INTERRUPTED AND THE INCINERATOR BREAKERS ARE IN THE OFF POSITION



2” opening for power supply in container 3

Feed the 600v 40Amp 60Hz power through the 2” opening in container 3 (power supply cable and 2“coupling to be provided by the customer) and connect the wires to the Main Disconnect. The main supply from the site can be turned on now.





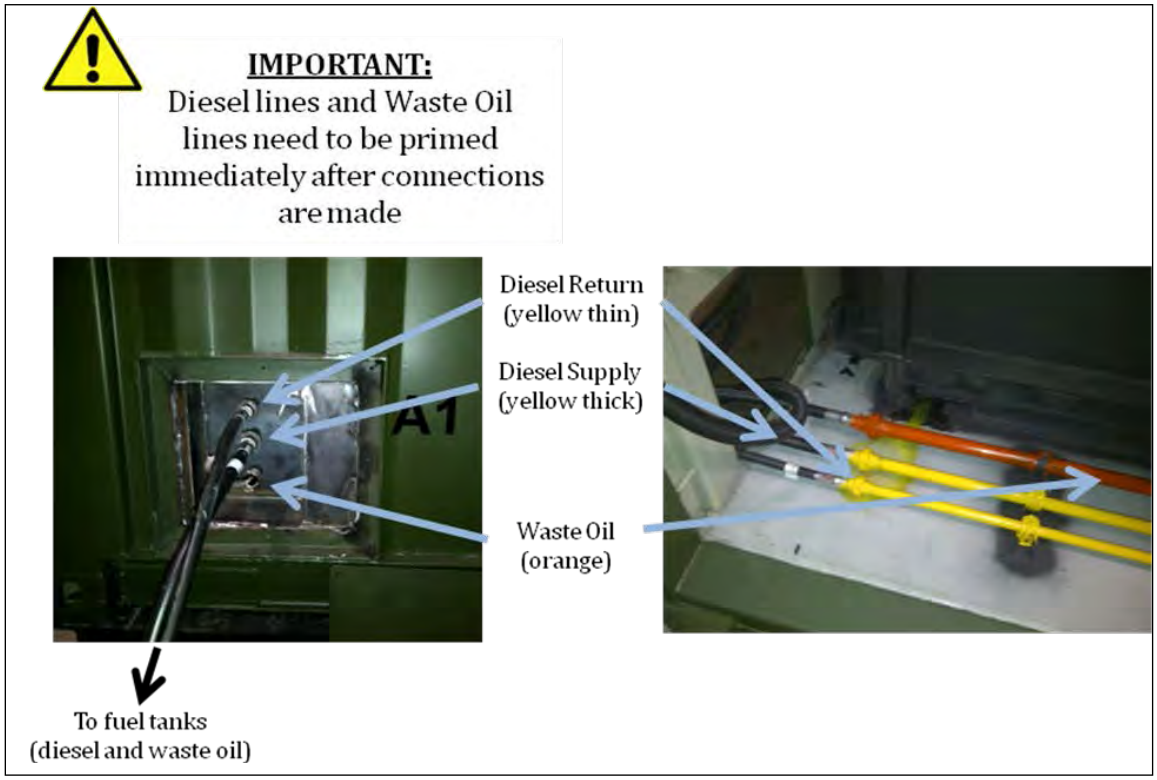
Switch on all incinerator breakers in the Breaker Panel

Control Panel Power On– turn on the power to the Control Panel.

3.1.4.6 INTERNAL CONNECTIONS

Compressed air quick connect for Waste Oil Burner

Connect the air hose from the Waste oil Burner to the quick connect fitting



Feed wires for the tanks' level sensors and waste oil tank heater from the tanks through the opening beside the hose adaptors and connect to the junction boxes

3.2 DISASSEMBLY INSTRUCTIONS

3.2.1 General Disassembly Information

The customer's personnel and/or contractors are responsible to:

3.2.1.1 Perform disassembly according to instructions provided by EWS in this *Manual*.

3.2.1.2 Disassemble I-beams, spacers and all incinerator component equipment using a crane, forklift, come-alongs, hydraulic jacks/hand-pumps, etc…

3.2.1.3 Disconnect all utility services including connections to the equipment including fuel, electrical, water, air, etc. using basic hand tools prior to disassembly

NOTA
Do not scale drawings: If certain dimensions are required which are not shown on drawings, EWS should be contacted for the required dimension. EWS will not be responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction, assembly and/or erection, unless so indicated.

Please note that some of the diagrams and/or photos in this FACILITY MANUAL are conceptual in nature and may not be exact representation of equipment purchased.

3.2.2 Preparation Prior to Disassembly

NOTA
DO NOT DISCONNECT THE INTERNAL ELECTRICAL CONNECTIONS UNTIL THE EXTERNAL POWER SUPPLY TO THE MOBILE INCINERATOR HAS BEEN SAFELY DISCONNECTED.

NOTA
TURN POWER OFF AT CUSTOMER SUPPLIED GENERATORS

The fuel supply connections (diesel and waste-oil) are located on the Primary Chamber Container and disconnect the fuel supply from the fuel tanks located externally. There are fuel lines between the containers for fuel distribution which are to be disconnected after the external hook-ups and connections have been disconnected.

NOTA
DO NOT DISCONNECT THE INTERNAL FUEL CONNECTIONS UNTIL THE EXTERNAL FUEL SUPPLY TO THE MOBILE INCINERATOR HAS BEEN DISCONNECTED.

3.2.3 Disassembly Overview

3.2.3.1 Specialized Tools and Equipment for Disassembly

The complete disassembly of the **EWS Mobile Incinerator** will require 2-3 full time personnel for 2 days. The following list identifies the equipment required to be supplied by the customer in order to proceed with the disassembly:

a. Crane
b. Forklift
c. Scissor Lift
d. Shims
e. Ladder (12')
f. Come-along
g. Hydraulic Jack/pump
h. Level
i. Erection Wrench / Alignment bar
j. Container Clamp 2-Wrench
k. Sling
l. I-beam Clamp

3.2.3.1 Disassembly Overview

The following general steps are the order in which the **EWS Mobile Incinerator** Package needs to be disassembled. Each step is detailed in the subsequent section.

ORDER OF DISASSEMBLY (as detailed in Section 3.2.4)

3.2.4.1 External Disconnections
3.2.4.2 Internal Disconnections
3.2.4.3 Internal Component Disconnections
3.2.4.4 Removal of opacity monitor
3.2.4.5 Removal of Stack Sections
3.2.4.6 Disassembly and Removal of Containers from Base Frame Structure
3.2.4.7 Disassembly of Base Frame Structure

NOTA

Important Notes to Consider Prior to and during Disassembly

a. Lifting lugs are provided on the stacks, and major accessories, and should be used when disassembling the incinerator

b. Do not allow lifting chains or cables to put loads on piping, or mounting flanges as they may be damaged.

c. Avoid dragging lifting gear across painted surfaces.

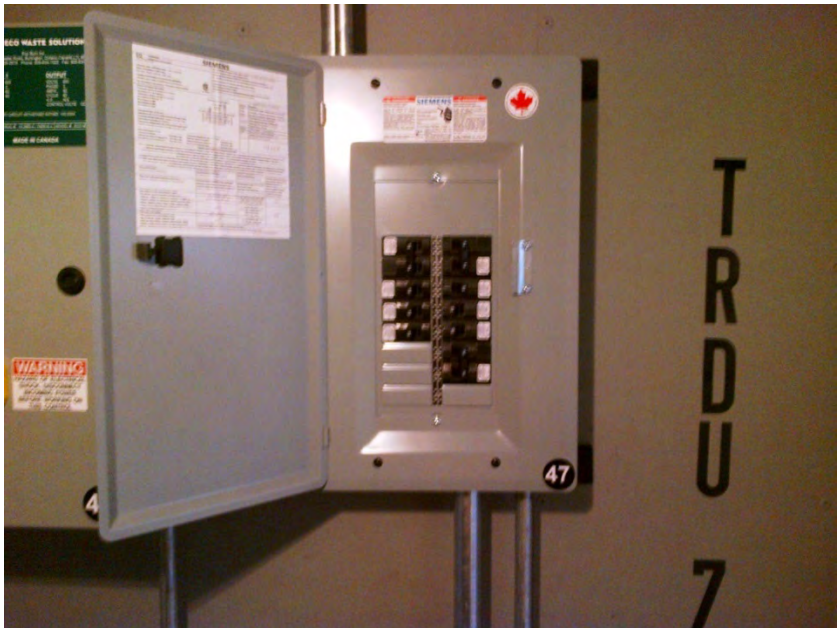
d. When removing the system from its position, be careful not to subject the refractory to mechanical shock, which may result in refractory damage.

3.2.4 Disassembly Instructions

3.2.4.1 EXTERNAL CONNECTIONS

Control Panel Power Off – turn off the power to the Control Panel.

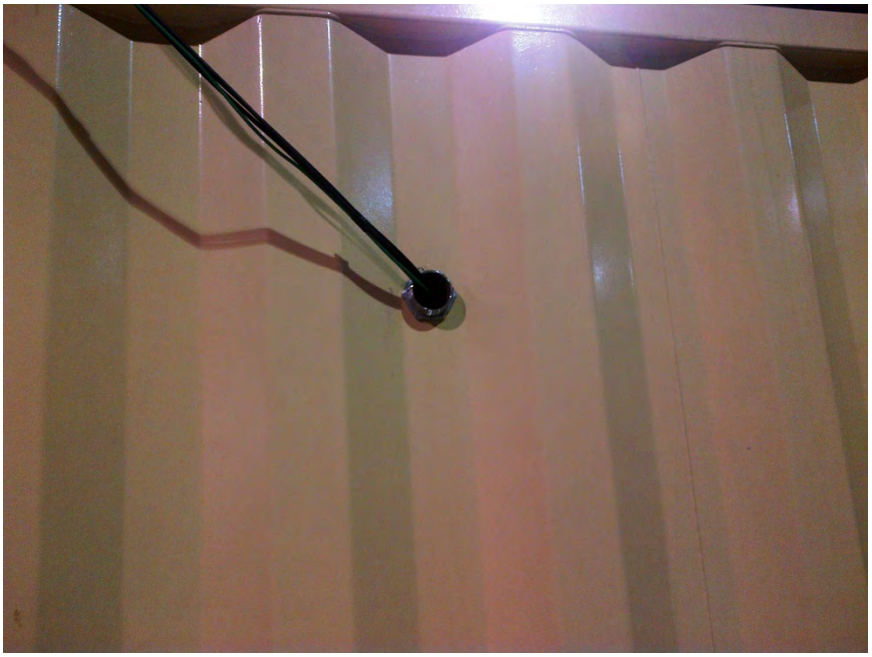
Main Power Disconnect – to be turned OFF before disconnecting any external or internal connections.



Switch off all breakers in the Breaker Panel

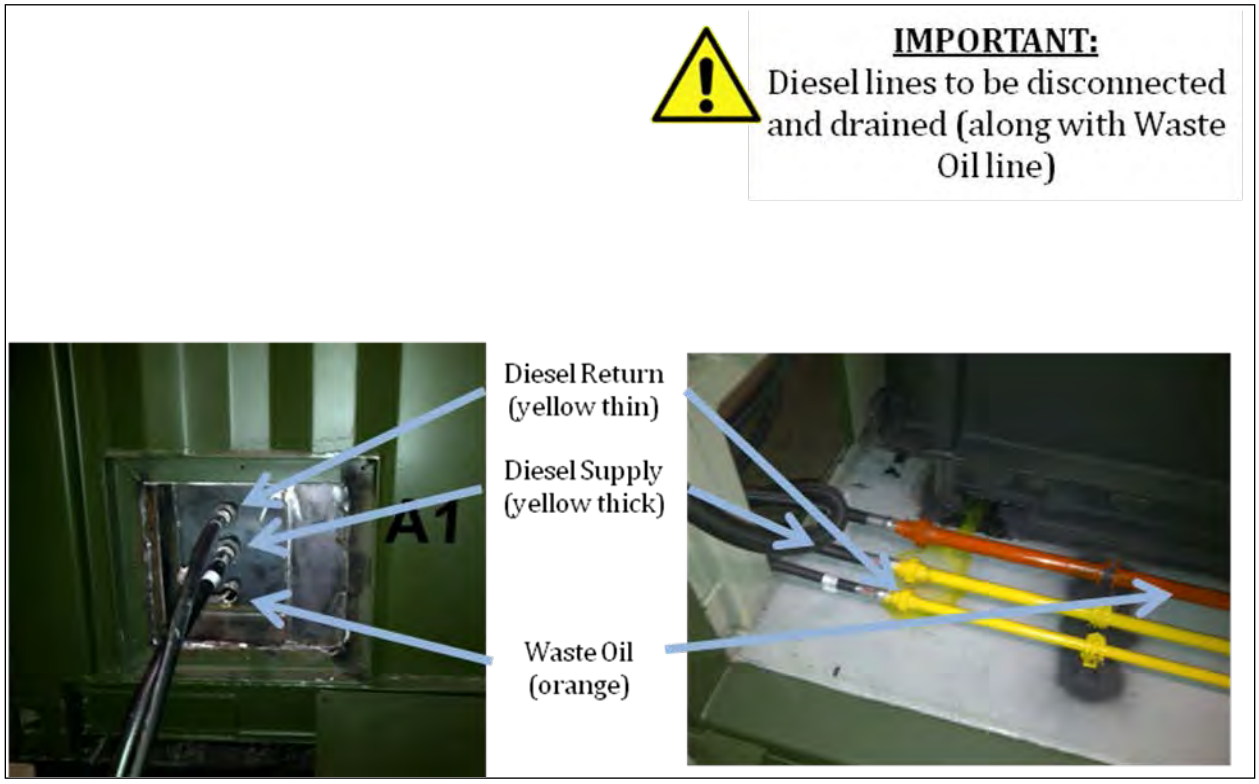
DO NOT DISCONNECT THE ELECTRICAL UNLESS THE BREAKERS ARE IN OFF POSITION

DO NOT DISCONNECT THE MAIN POWER FEED UNLESS THE MAIN SUPPLY FORM THE SITE HAS BEEN INTERRUPTED



2” opening for power supply in container 3

Disconnect the wires to the Main Disconnect and remove the 600v 40Amp 60Hz power through the 2” opening in container 3



Disconnect wires to the tanks level sensors and waste oil tank heater from the junction boxes and remove then through the opening beside the hose adaptors.

3.2.4.2 INTERNAL CONNECTIONS

Junction Boxes in container 1 (primary chamber)

Junction Boxes in container 3 (control container)

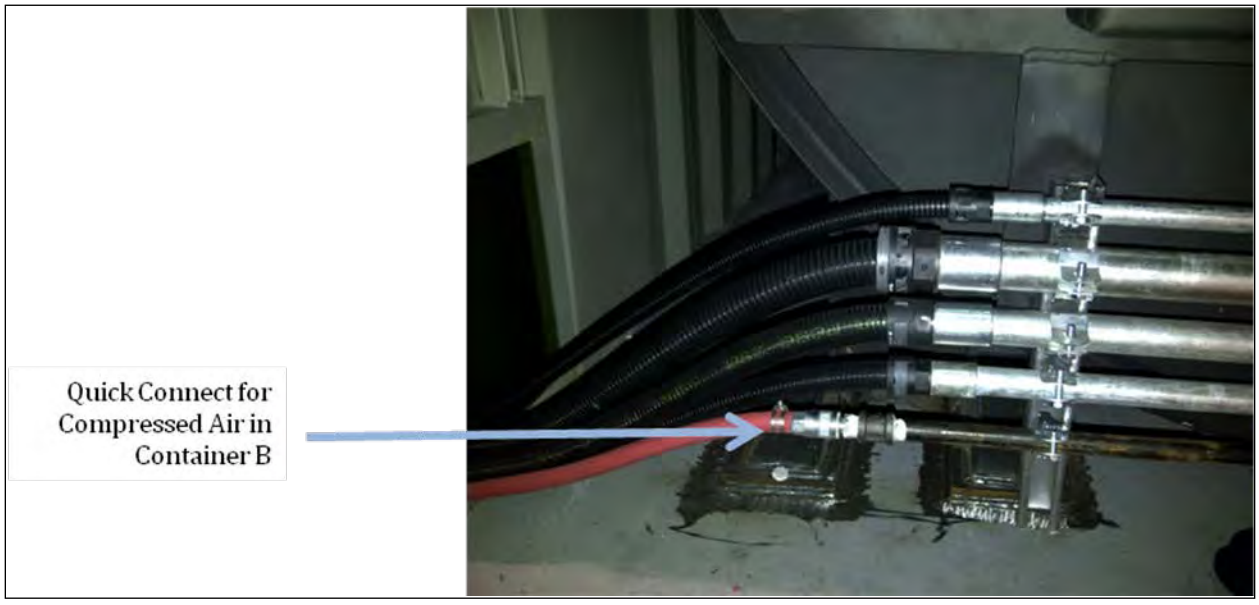
Disconnect the wires from the terminal block inside every junction box in both Container 1 and 3, replace any wire labels and conduit labels missing or damaged

Flexible conduit in Container 2 (secondary chamber)

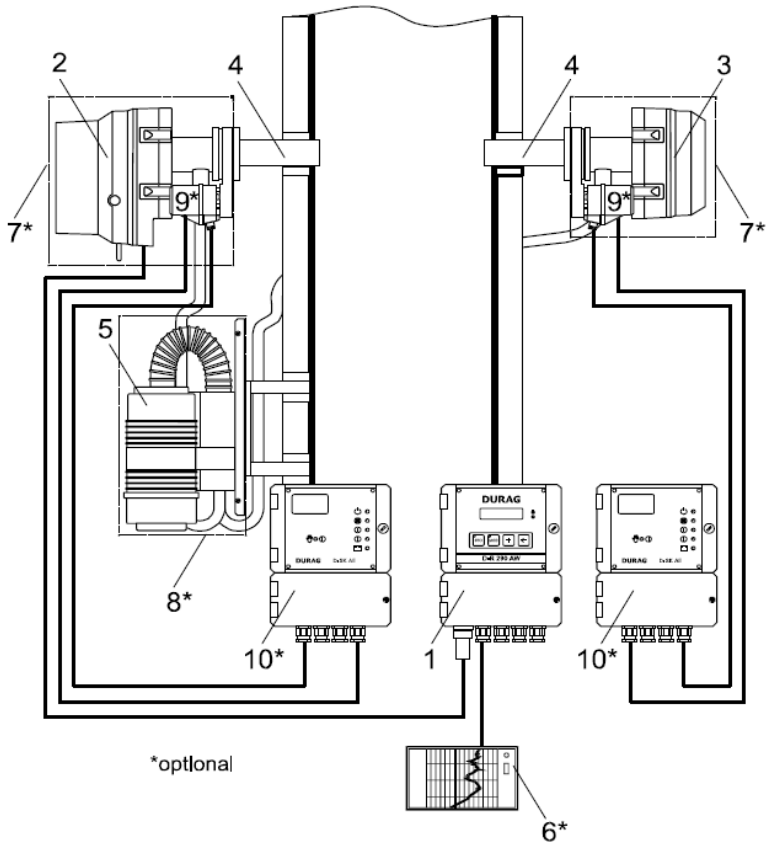
Pull the flexible conduit from container 1 and 3 into container 2 through the openings connecting the containers

Compressed air quick connect for Waste Oil Burner

Disconnect the air hose for the Waste oil Burner from the quick connect fitting



3.2.4.3 REMOVAL OF OPACITY MONITOR



	Standard		* Optional
1	Control unit, D-R 290 AZ (stack display) Or D-R 290 AW (evaluation unit)	6	Customer supplied recorder or data logging system
2	Transceiver, D-R 290 MK	7 & 8	Weather Hood, US built systems use one
3	Reflector, D-R 290 R1 or R2		Large weather hood for blower and optics
4	Mounting flange, D-R 280 E	9	Fail-safe shutters
5	Purge air unit	10	Fail-safe shutter control electronics

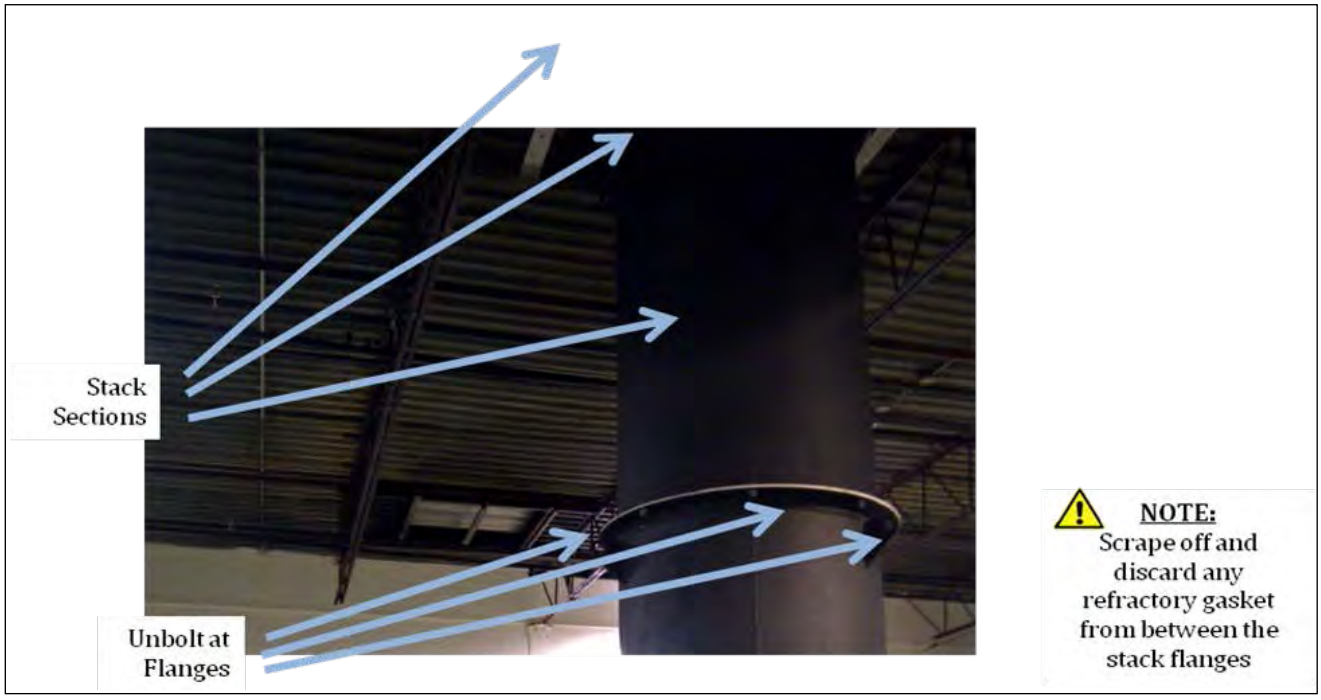
Disconnect power to the Purge Air Unit

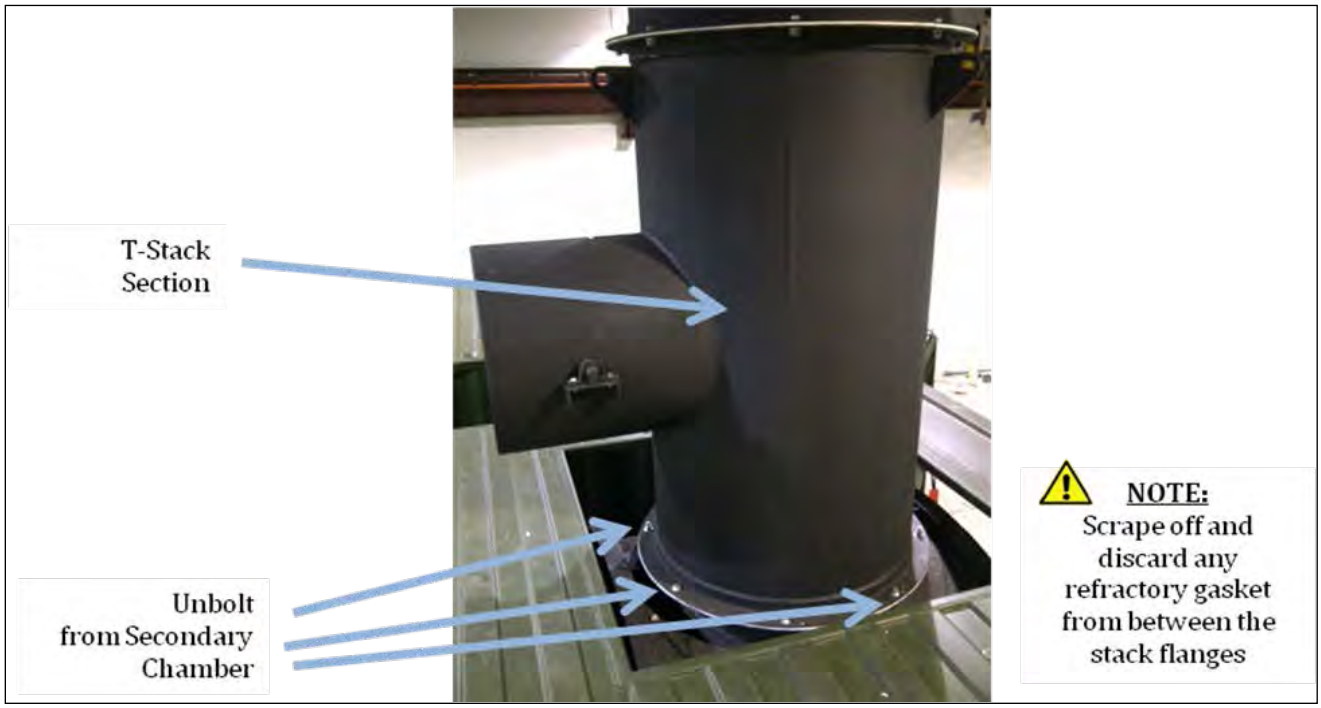
Disconnect the Transceiver to the Control unit

Uninstall the Purge Air Unit in the bracket provided in the T-Stack

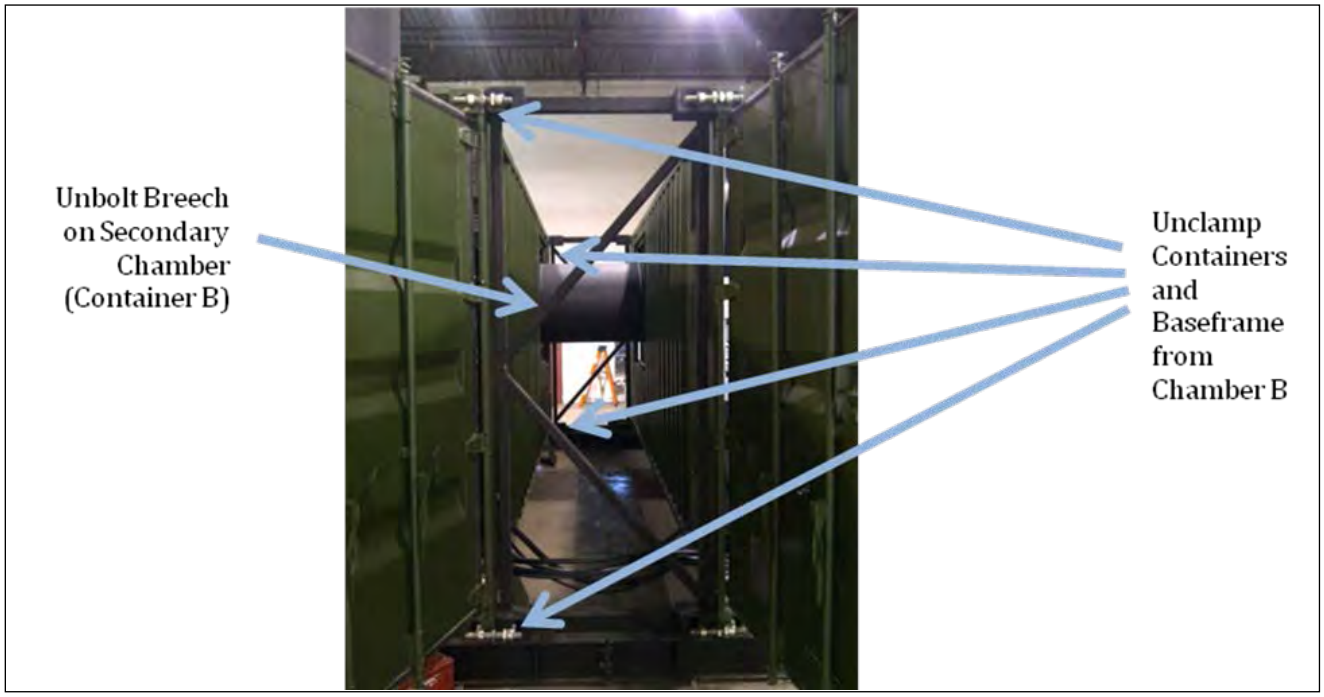
Uninstall the Transceiver and Reflector in the flanges provided in the stack section

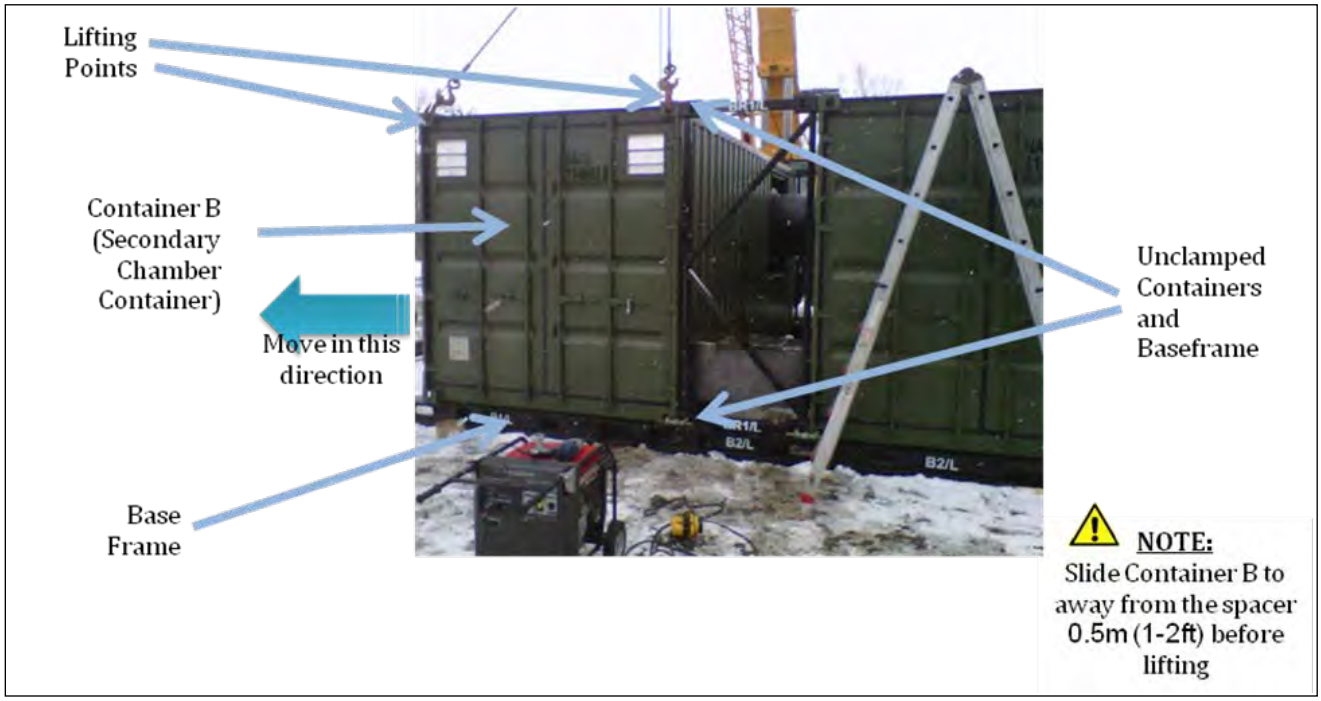
3.2.4.4 REMOVAL OF STACK SECTIONS



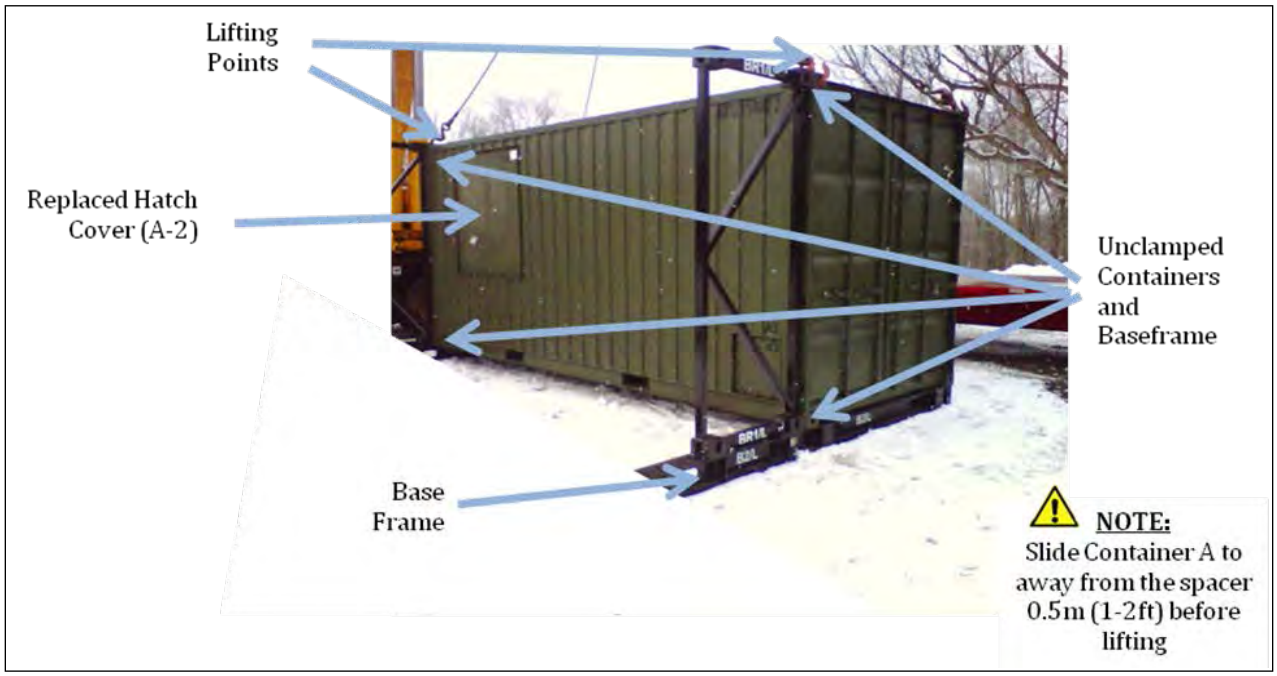


3.2.4.5 DISASSEMBLY AND REMOVAL OF CONTAINERS FROM BASE FRAME STRUCTURE

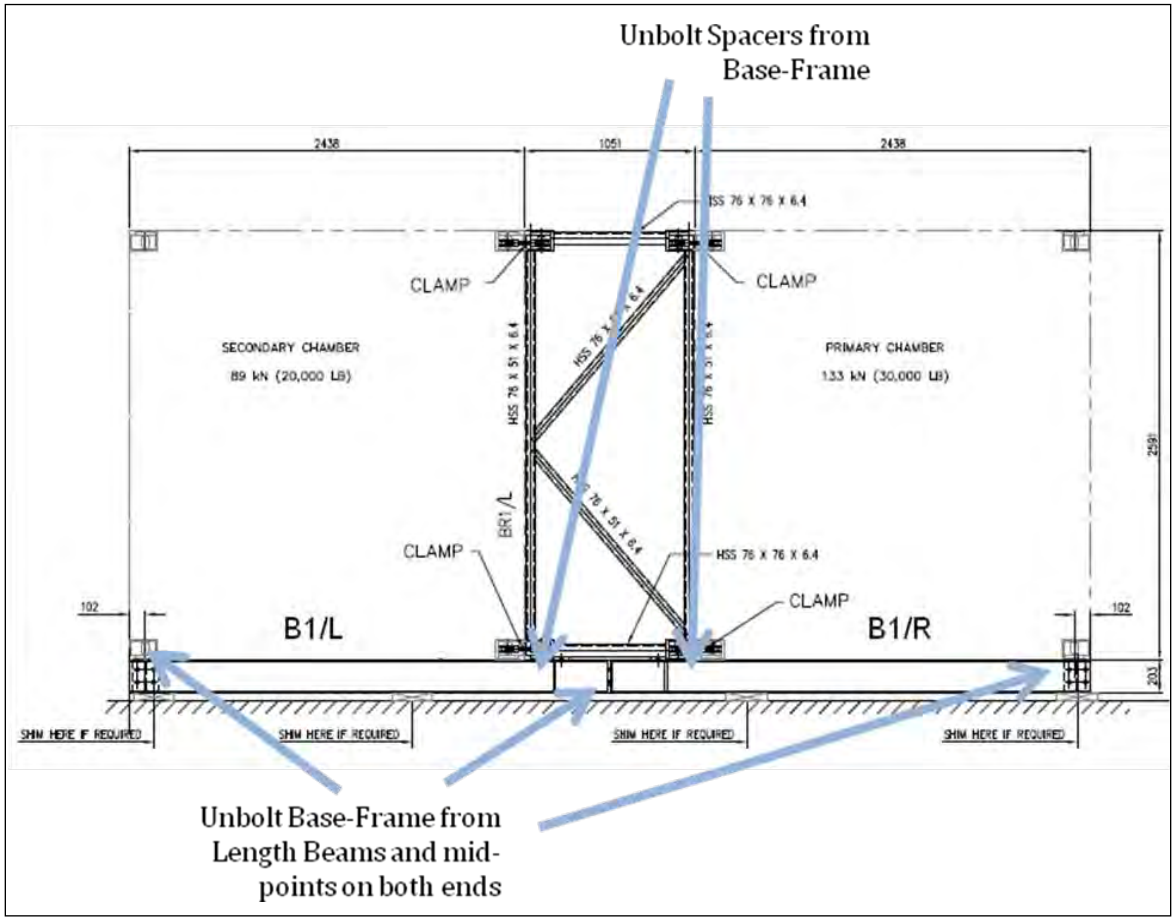

Unbolt Breech on Secondary Chamber (Container B)
Unclamp Containers and Baseframe from Chamber B

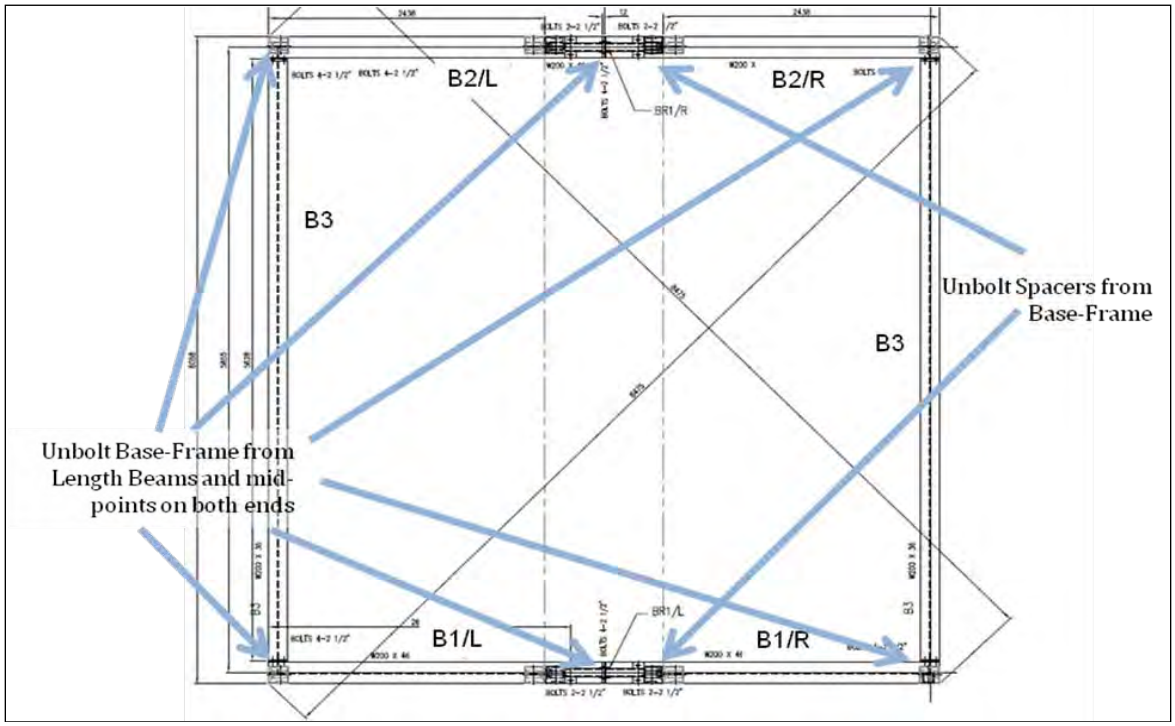

Lifting Points
Container B (Secondary Chamber Container)
Move in this direction
Base Frame
Unclamped Containers and Baseframe
NOTE:
Slide Container B to away from the spacer 0.5m (1-2ft) before lifting


Unbolt Breech on Primary Chamber (sling and brace to support with forklift or bobcat)
Container A
Remove Utility Tunnel
Unclamp Containers and Base-frame from Container A
BR1/L
B2/L


Lifting Points
Replaced Hatch Cover (A-2)
Unclamped Containers and Baseframe
Base Frame
NOTE:
Slide Container A to away from the spacer 0.5m (1-2ft) before lifting

DISASSEMBLY OF BASE FRAME STRUCTURE





Miscellaneous Final Items:

- Replace all remaining hatch covers on Containers A, B and C
- Pack all remaining parts for shipment:
  Nuts, bolts and washers
  Stacks, t-section and breech on marked skids
  I-beams and spacers from the base-frame
  Fuel and Waste Oil tanks

3.2.4.6 PREPARATION FOR STORAGE AND WHILE IN STORAGE

The following items will be required for final packing and storage:

- Lubricant (Lithium Spray Grease)
- Standard Grease (Mobilgrease 28)
- Silicone (MONO Ultra)
- Desiccant (Shipping Container Desiccant)

1. **Primary Chamber Container (1) and Secondary Chamber Container (2):**

General

a. Place desiccant bags under chambers and replace every 6 months

b. Lubricate door frames (hinges and bearings) using standard grease.

c. Place desiccant bags in the Primary and Secondary Chambers and replace every 6 months.

d. Seal all container openings with silicone rubber caulking (Sealastic® or equal - block to discourage pilfering).

Ventilation and Exhaust Fans

e. Coat coupling and all external machined parts with standard grease.

f. Spray light penetrating oil on fan wheel.

g. For long term or outdoor storage, mounted bearings should be re-greased and wrapped with plastic for protection. Rotate the fan wheel by hand at least every two weeks to redistribute grease on internal bearing parts. Each month the bearings should be purged with new grease to remove condensation, since even a filled bearing can accumulate moisture. Use caution when purging, as excessive pressure can damage the seals. Rotate the shaft while slowly adding grease. Place desiccant bag in fan housing and replace every 6 months.

Fan and Pump Motors

h. Spray light penetrating oil on the shafts of the motors.

i. Fill bearing housing with grease containing five percent rust-preventive concentrate.

j. Coat all exposed machined parts with standard grease

k. Do not rotate motors

2. **Controls Container (3)**

Air Compressor

a. Purge compressor cylinders of hydrocarbons.

b. Blank compressor suction and discharge.

c. Fill crankcase, cooling water jacket and valves with oil containing five percent rust-preventive concentrate. Allow space for thermal expansion.

d. Coat all exposed machined parts with standard grease.

e. Top-up oil level in the cooling water jacket.

f. Controls container must be stored in a climate-controlled building during this period to protect the PLC and instrumentation from freezing temperatures or fluctuations in temperature that go below the dew point. No components will require special attention if the container is stored in a building kept above the dew point temperature (e.g. above 15°C at less than 35% relative humidity).

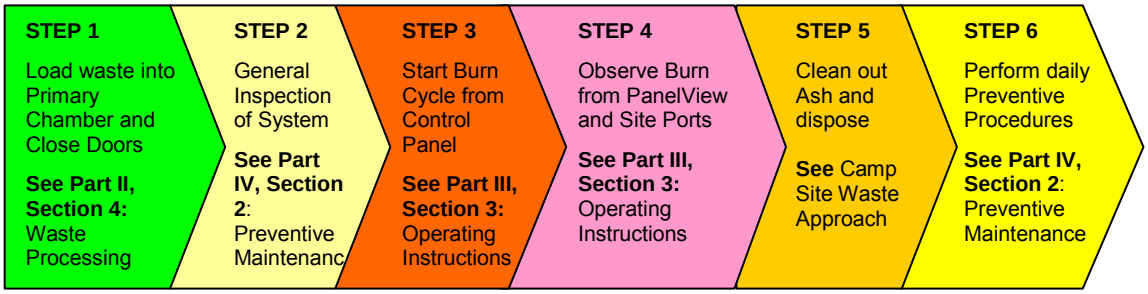
3.2.4.7 PACKING SKIDS AND CRATES IN CONTAINERS

1. Prior to shipment ensure all components are strapped and fastened within the container.

2. If all above items were followed for the preparation and while in storage, the system should be ready for shipment and usage.

3.3 OPERATING INSTRUCTIONS

The operation of the Mobile Waste Incinerator package follows 6 general steps that take place over a 24 hour period.



This section focuses on Steps 3 and 4 and how to start the system and monitor it during operation, however it is assumed that the waste is properly loaded with the weight, density and type stated in Part II Section 4. It is also assumed that the waste is loaded after the ash has been removed from the previous burn cycle and any daily maintenance routines have been completed.

3.3.1 Operator Interface

3.3.1.1 Control Panel Components

Rear View:

1. Main Disconnect Switch
2. Panel View Operator Panel
3. Control Power ON
4. Emergency Stop Button
5. Ethernet Ports

1. Main Disconnect Switch : Controls all power to the system.

2. PanelView Operator Interface ("PanelView"): Displays various screens reflecting system performance.

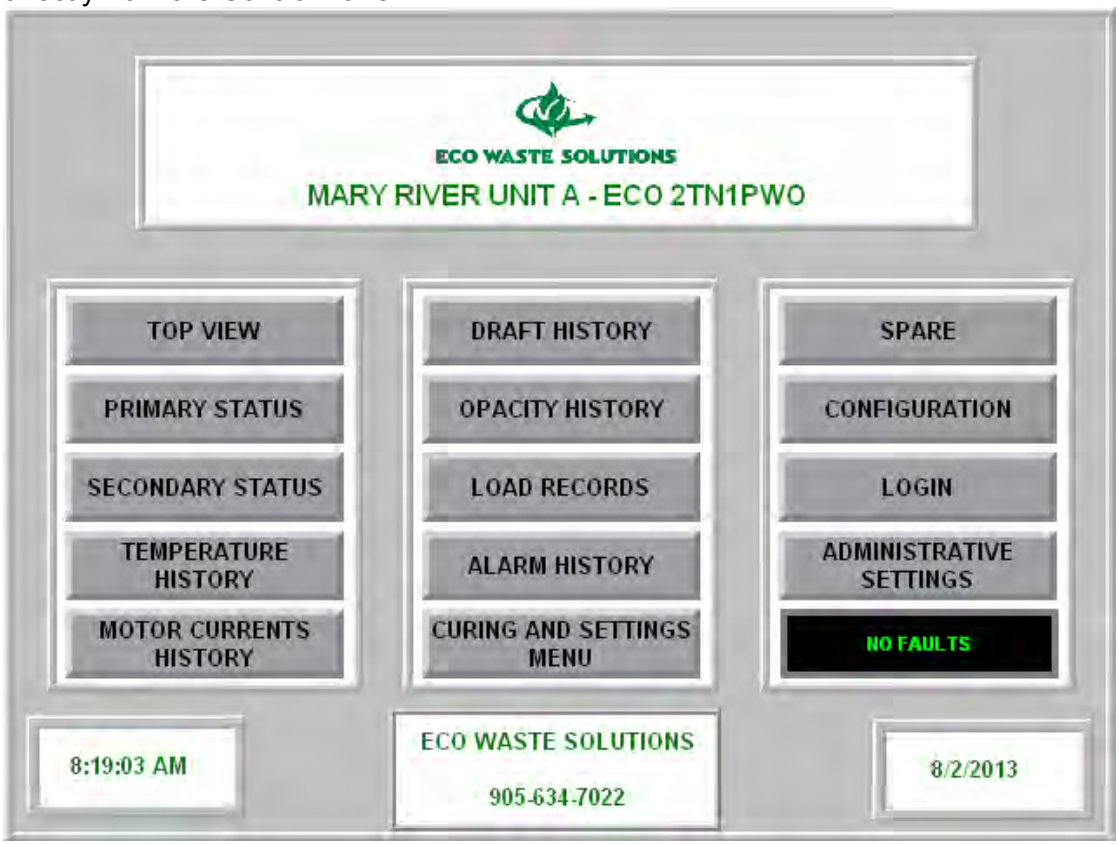
3. Control Power On:
   1 – Green light indicates the control power in the panel is on;
   2 – Pushing this button if the E-stop is out will turn on the control power.

4. Emergency Stop Keylock Button: Stops the current burn cycle in progress and disables the ability to restarting it.

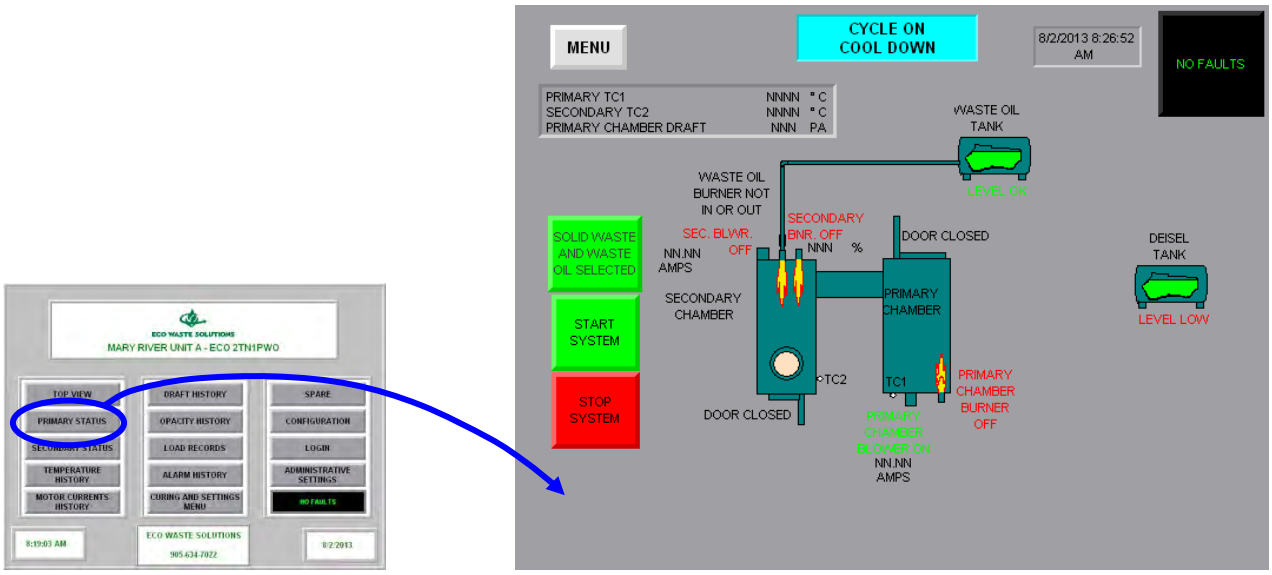
5. USB Flash Drive Port: Port used to insert USB drive to download system historical usage data.

3.3.1.2 Operator Interface

The PanelView Operator Interface controls the operation of the mobile incinerator package directly from the Control Panel.

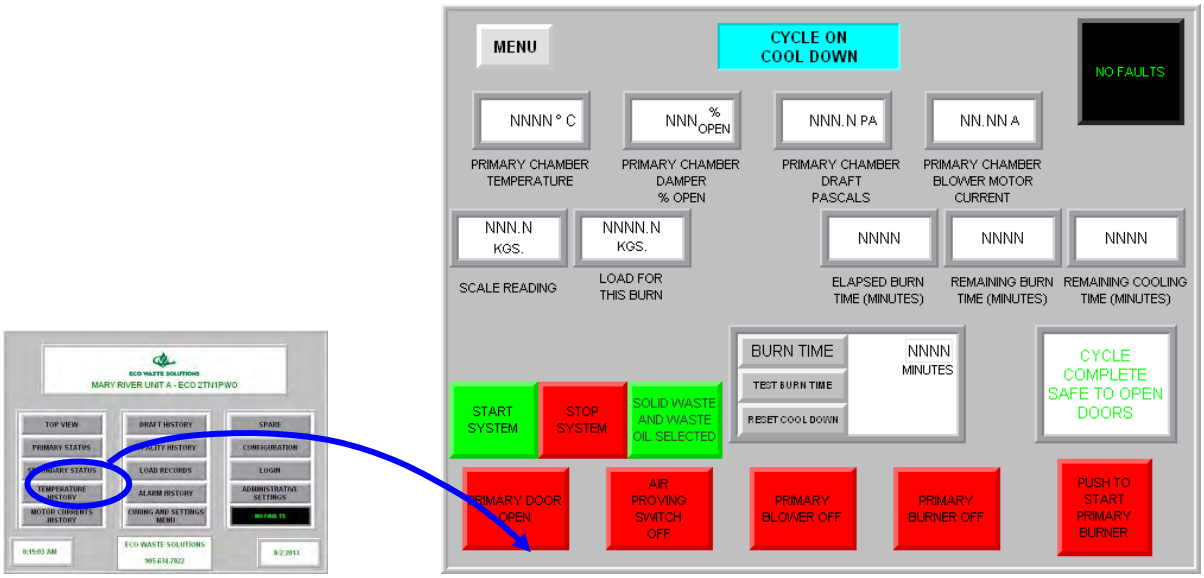


The main screen displays all the available options for viewing the system in operation. The PanelView is a touch-screen and items can be selected by touching them on the screen.



When the **TOP VIEW** button is selected, an overview of the incinerator and related components are displayed. This shows key temperatures, flows, and other indicators of what is happening in the process in a real-time basis.

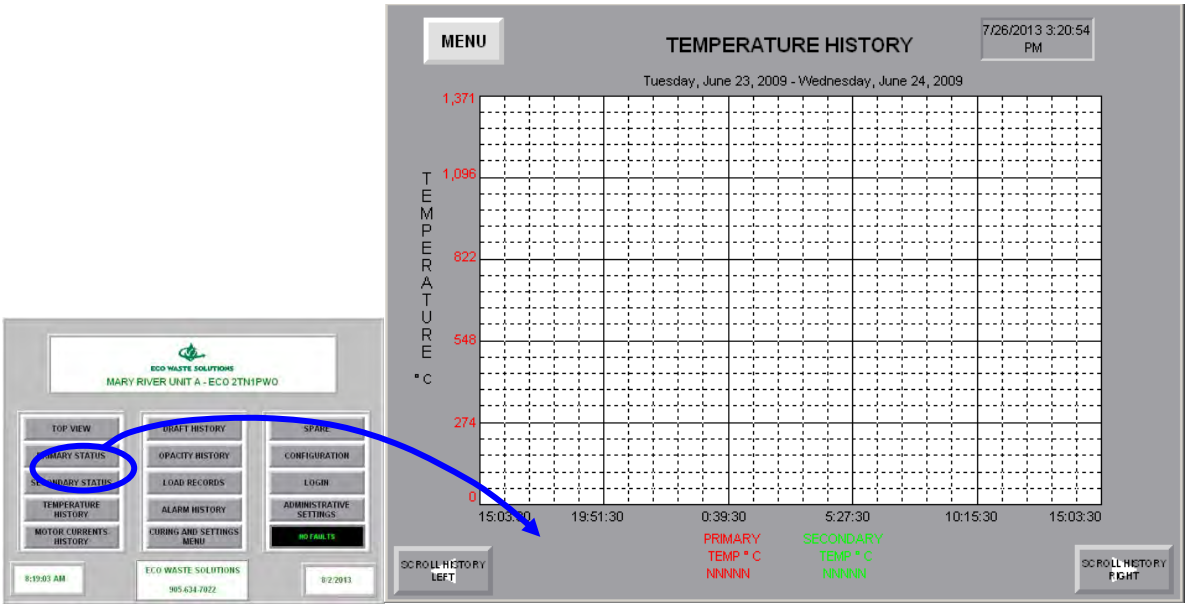
The system will not start if there are alarms or faults present. To clear (acknowledge faults) At any time, touch or press **MENU** to go back to the main screen.



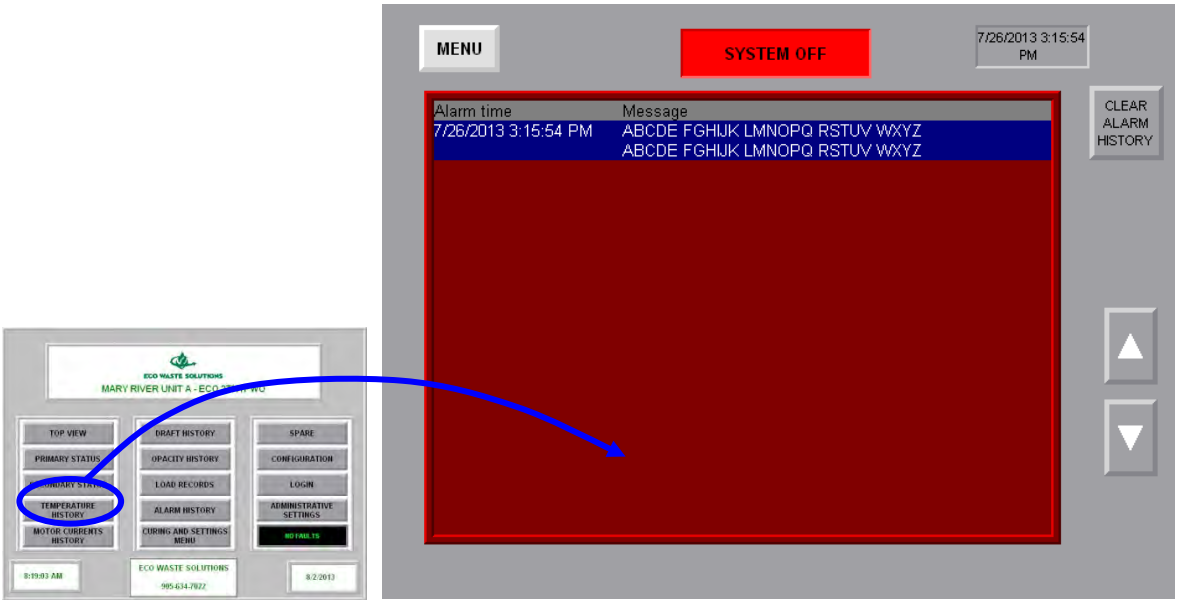
When the PRIMARY or SECONDARY SYSTEM STATUS is selected from the Main Menu a screen (above) will display the status of all the operating parameters of the respective chamber such as the temperatures and the time remaining in the cycle as well as displaying other informational items such as status of the door and blowers, etc.

The operator can change the burn time of the cycle by selecting “BURN TIME” and entering a time (in minutes). The operator may do this over time to either prolong the burn time, or decrease the burn time depending on the waste mix. (E.g. a very wet batch of garbage will take more time than a dryer batch of waste).

At any time, touch or press **MENU** to go back to the main screen.



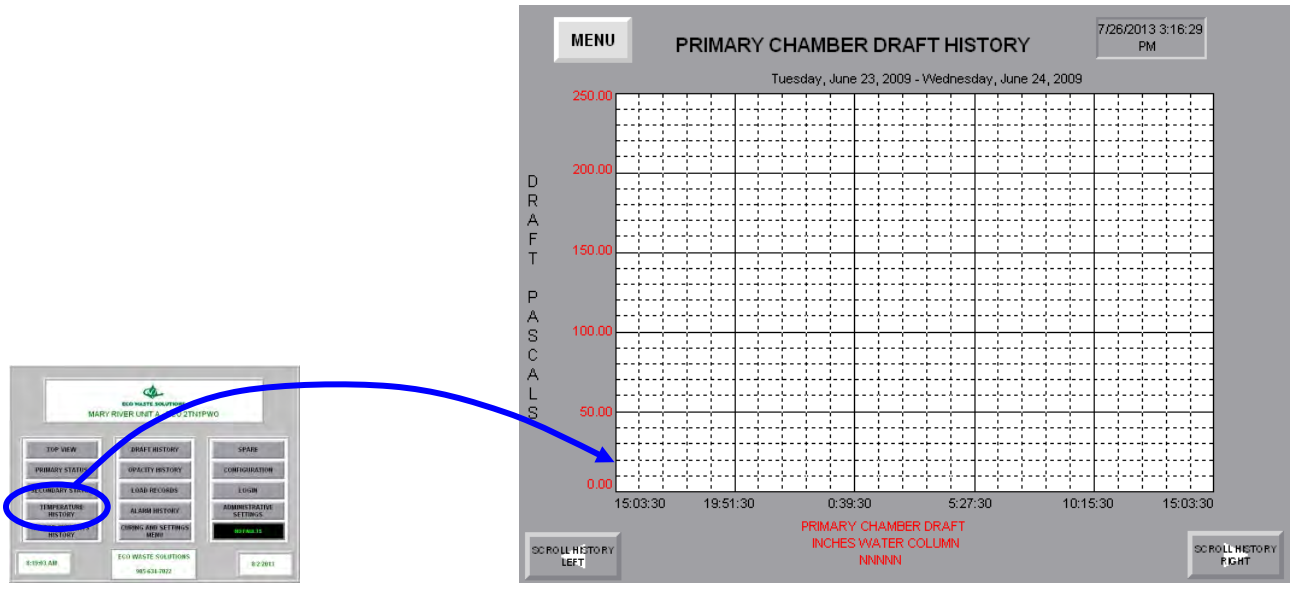
When the **TEMPERATURE HISTORY** is selected the screen will display the temperature history for the last burn showing various temperatures throughout the system. This information is stored for 30 days.



When **ALARM HISTORY** is selected the screen displays the last 25 faults with the date & time of occurrence. The operator can press the CLEAR ALARM HISTORY to clear all of the faults. The operator can also clear individual alarms by selecting them on-screen and pressing the ACKNOWLEDGE button.

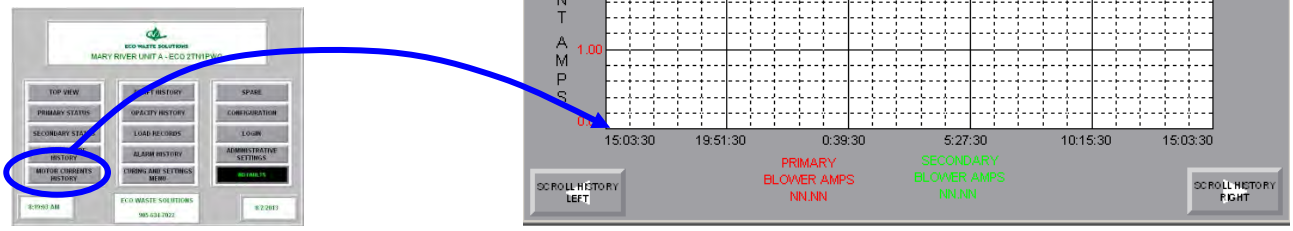
The operator can select **ALARM COUNT**, and view the specific number of alarm faults.

At any time, touch or press **MENU** to go back to the main screen.



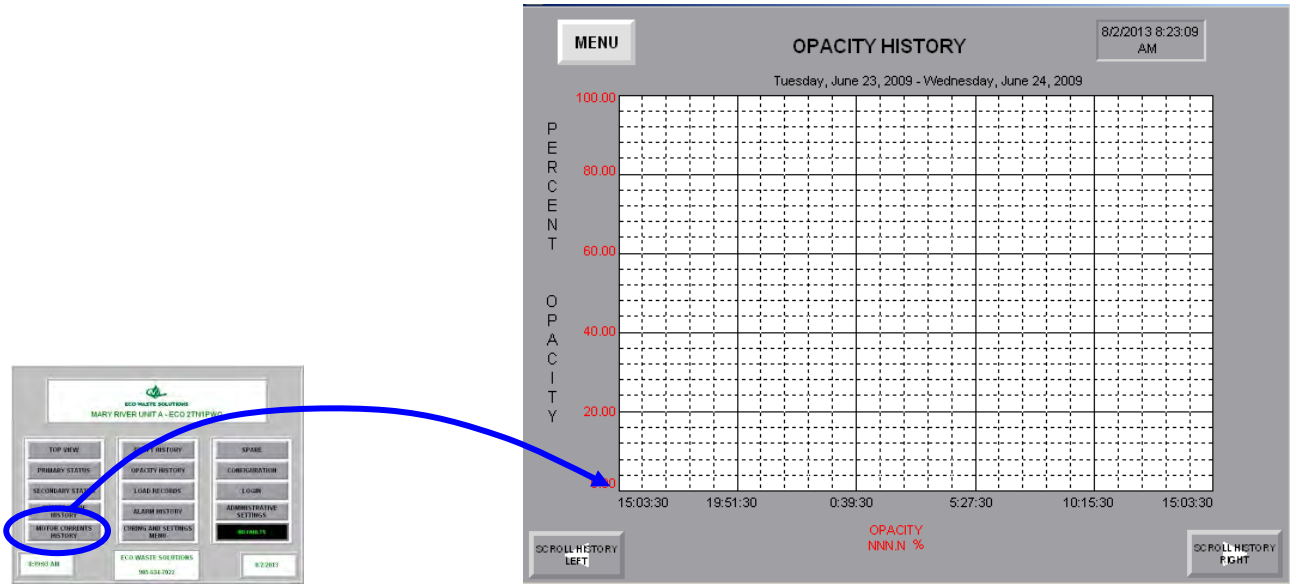
When the **DRAFT HISTORY** is selected the screen will display the draft history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.



When the **MOTOR CURRENT HISTORY** is selected the screen will display the motor current history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.



When the **OPACITY HISTORY** is selected the screen will display the opacity current history for the last burn showing data throughout the system. This information is stored for 30 days.

At any time, touch or press **MENU** to go back to the main screen.

3.3.1.3 Starting the Cycle

To start the burn cycle, ensure that the waste is loaded into the system according to the waste mix described in Part II Section 4 and not blocking the burner cone or area where the flame will be directed into the Primary Chamber. Make sure the door is clamped in all places on the Primary Chamber.

At the control panel, on the Panel View press the “Start System” button and the system will initiate the Purge Cycle, followed by the Burn Cycle and then ending with the Cool Down Cycle.

3.3.1.4 Purge Cycle

This is the first step in the burn cycle and is in place for safety reasons. The purge exhausts potentially explosive gases that could be remaining in the system and burners. The primary and secondary blowers will run to purge both chambers. The primary and secondary blower indicators on the Top View screen on the Operator Interface will say “Primary Chamber Blower On” and “Secondary Blower On”

3.3.1.5 Burn Cycle

When the purge is finished the Secondary Burner will come on and for safety reasons will perform a purge and then ignite. Once the Secondary Chamber temperature reaches 1000°C the Primary burner will purge and then ignite. The burn cycle time will start when the Primary Chamber temperature reaches 427°C

The Secondary Burner will modulate to maintain Secondary temperature. If the Secondary Chamber starts getting too hot the Secondary damper opens and the blower will increase in speed to assist with cooling. When the secondary chamber cools down the damper will start to close again.

When the waste in the Primary chamber starts to burn hot enough, the primary burner turns off (815^{o}C) and stays off. When the waste can no longer sustain the temperature in the Primary chamber, the primary burner will come back on (760^{o}C). This will continue until the remaining burn time reaches zero.

When the burn time reaches zero, the system will enter the cool down cycle. The Primary chamber and Secondary chamber burners turn off; the secondary chamber blower turns off and the primary blower starts and runs until the cool down cycle is complete. The cool down cycle is complete after the cool down timer has timed out.

3.3.1.6 Using Historical Charts

a. Go to the Main Screen of the control panel operator interface.
b. Select the historical chart you want to view (e.g. Temperature, Draft, etc).
c. Once the desired chart appears the “buttons” on the bottom left and right of the screen can be used to scroll through to previous days’ information by selecting them and holding down.
d. Once the desired date is selected the graph will be on the screen indicating the time and specific data trends (e.g. Temperature, Draft, etc) of the burn.

3.3.2 Procedure before Start Up

The operating instructions are to occur once the assembly of the system is completed and inspected. Before you continue with the operating instructions ensure that the following items are completed:

a. All physical components attached and bolted
b. All internal electrical connections are completed
c. All internal fuel and air connections are completed
d. All external fuel lines have been connected (tanks to container)

NOTA
Before connecting the external electrical connection, ensure that all internal electrical connections have been made

Once all the above activities and the assembly instructions have been completed, follow the procedure outlined below:

3.3.2.1 Located in the control room of the Controls Container turn on the power on the Main Disconnect

a. If red light is illuminated, change the phase on customer-supplied power. DO NOT TRY CHANGING THE PHASE ON EWS SUPPLY.

b. If green light is illuminated, power supply and phasing are confirmed and start-up procedures can be continued

3.3.2.2 Turn lights on, located in the auxiliary power breaker panel

3.3.2.3 Turn exhaust fan on, located at the auxiliary power breaker panel

a. If outside ambient temperature < 5˚C: Turn heater on from the auxiliary power breaker panel because the temperature in Controls side of container must be > 5˚C

3.3.2.4 Turn on remaining breaker in auxiliary panel

3.3.2.5 Once the Human Machine Interface (HMI) (Panel View) is running and power sequence is correct push the “Control Power On” button.

3.3.2.6 Ensure there is power supply to all containers by selecting the Top View from Panel view and check:
a. All temperature readings (if 1371˚C is displayed the thermocouple is not connected or is faulty.)

b. That the Primary and Secondary Chamber door position on screen is the same as on the system, if shown incorrectly check limit switch

3.3.2.7 Fill fuel tank and the Waste Oil Tank if the planned burn is with waste oil

NOTA ONLY DIESEL FUEL CAN BE STORED IN THE DIESEL FUEL TANK

Before filling the tank ensure:

a. The storage tank is in good condition, e.g. tank shall not exhibit severe rusting, apparent structural defects or deterioration.

b. No leaking visible. If leaking is detected perform the following clean-up steps:
   i. Stop the release
   ii. Contain the released fuel
   iii. Clean up and properly manage the released fuel as per best environmental standards
   iv. Repair or replace the leaking tank prior to returning it to service.

c. Inspect the bottom of tank for sludge formation. Perform the following steps.
   i. Remove fuel tank access cover.
   ii. Do a visual inspection of the inside of the tank, clean if necessary. A drain valve is located at the bottom of the tank to assist with cleanout. Ensure the drain valve is in place before filling.
   iii. Ensure valve is closed
   iv. Fill the tank through the access.

NOTA

Load the oldest liquid inventory first. Long term storage may result in the formation of sludge or the growth of soluble and insoluble bacteria that can clog the downstream filters.

When the tank is full, do a “walk around” of the tank and inspect tank for leaks and structural defects.

3.3.2.8 Ensure all ball valves are in the open position.

3.3.2.9 Physically prime the Primary Burner located in the Primary Chamber container

a. Using scaffolding, a scissor-lift, or another safe method of elevation, prime the fuel line by inserting a funnel into the opening where the line meets the connector to the tank. Fill using a 20 L diesel fuel container until the line is devoid of air, taking care to avoid spillage.

b. **Before starting the burner, make sure that the tank return line is not clogged.**

c. The pump leaves the factory with the by-pass closed.

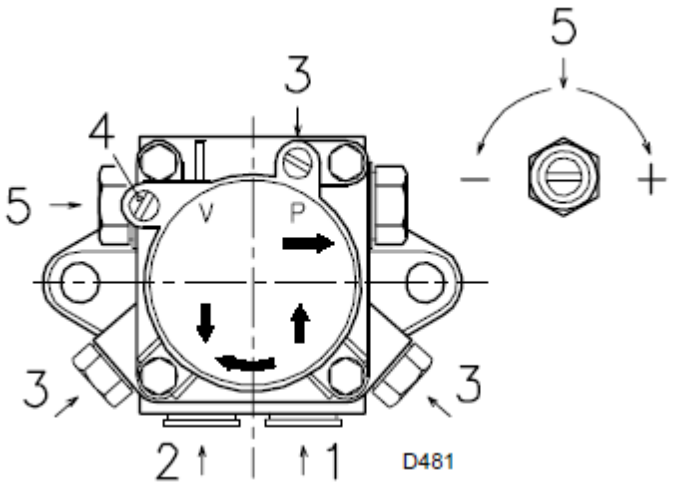


Figure A

d. In order for self-priming to take place, one of the screws (#3) must be loosened in order to bleed off the air contained in the suction line; see Figure A (above) of the pump. Start with switch #1 see Figure B (below) in the "ON" position. The pump must rotate in the direction of the arrow marked on the cover.

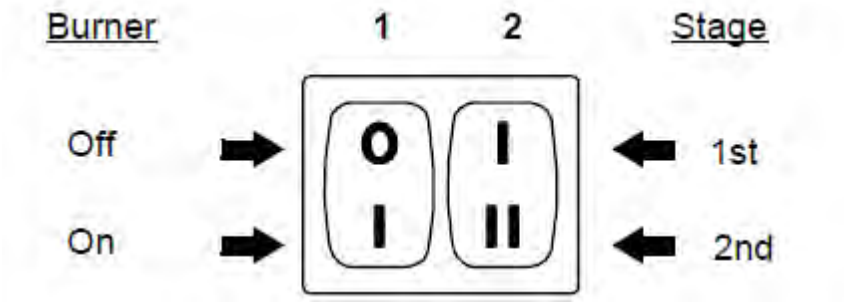


Figure B

e. The pump can be considered to be primed when the light oil starts coming out of the screw #3 see Figure A (above). Stop the burner: switch #1 see Figure B (above) set to "OFF" and tighten the screw #3 see Figure A (above). The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner (by pressing the reset button, red illuminated button on the control box), and then repeat the starting operation as often as required. And so on.

f. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

g. Do not let extraneous light hit the photocell or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.

h. **NOTA The pump is full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize.**

i. Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump

3.3.2.10 Physically prime the Secondary Burner located in the Secondary Chamber container

a. Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the sealing organ located on the pump shaft to break.

b. In order for self-priming to take place, screw #3 see Figure C (below) of the pump must be loosened in order to bleed off the air contained in the suction line.

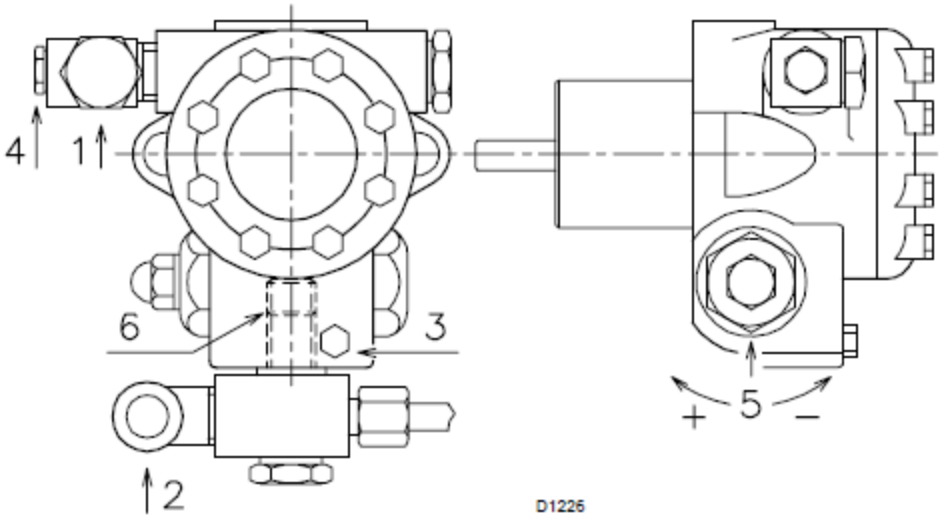


Figure C

c. Start the burner by closing the control devices with switch #1 in Figure D (below) in the "MAN" position. As soon as the burner starts, check the direction of rotation of the fan blade, by looking through the flame inspection window.

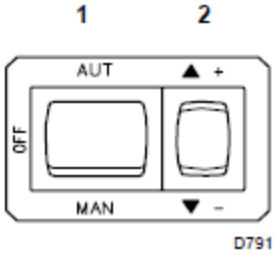


Figure D

d. The pump can be considered primed when the light oil starts coming out of screw #3 in Figure C (above). Stop the burner: switch #1 in Figure D (above) set to "OFF" and tighten screw #3 in Figure C (above). The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

e. **NOTA The pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize**.

Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump.

3.3.3 First Time Use (WILL ONLY BE PERFORMED ON SYSTEM ONCE)

NOTA:
This is to be performed the first time the system is ever used; it will only be required to be done once.

3.3.3.1 From Panel View Main Screen select Curing.

3.3.3.2 From the Curing menu select Curing Status push the following buttons to set up the curing for Primary and Secondary Chamber “Push to enable Primary Curing” and push “Push to enable Secondary Curing”

3.3.3.3 From Panel View press Start Cure

3.3.3.4 The system will start the curing process which takes 24 – 30 hours

3.3.3.5 If the curing cycle is interrupted reset the curing cycle from the Curing Status screen

3.3.3.6 The cycle will restart from where it got interrupted.

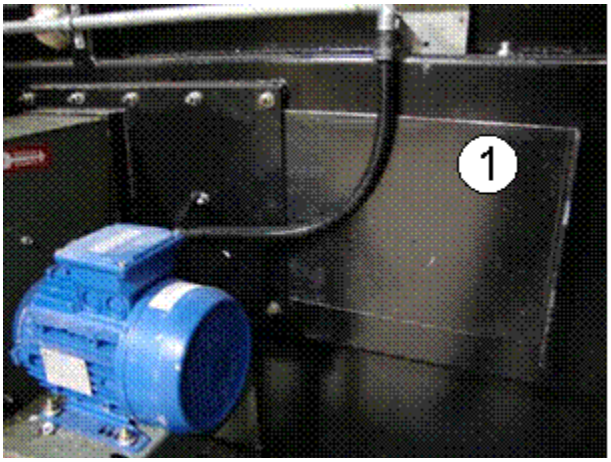
3.3.4 Standard Operating Procedures

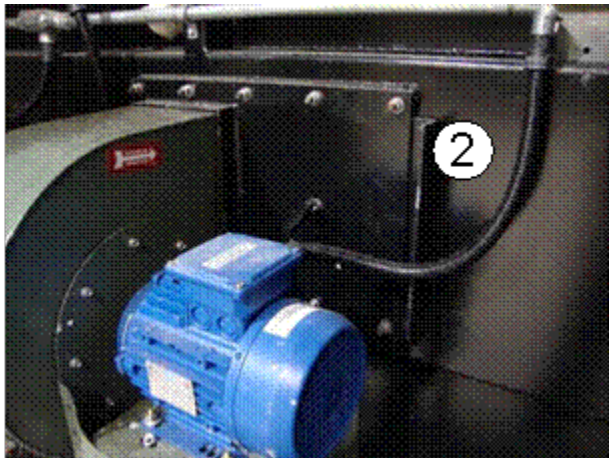
The following section details the procedures for the operation of the incinerator.

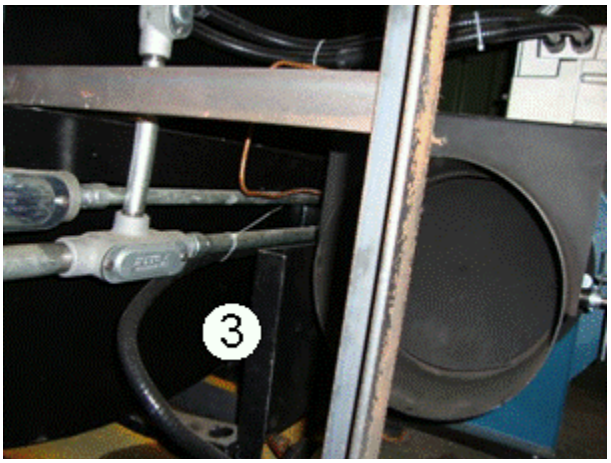
3.3.4.1 System Start up (solid waste only)

a. Drain the air compressor before starting system

b. Ensure that manual slide gates for each blower are in the open position for free airflow into the Primary and Secondary Chambers.



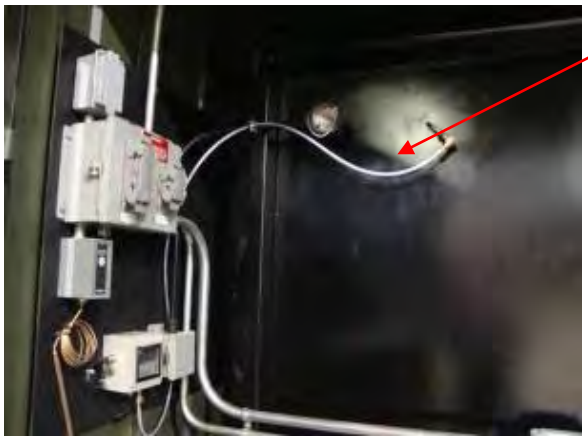




1. Primary Chamber blower Manual Slide Gate Open Position
2. Primary Chamber blower Manual Slide Gate Closed Position
3. Secondary Chamber blower Manual Slide Gate Open

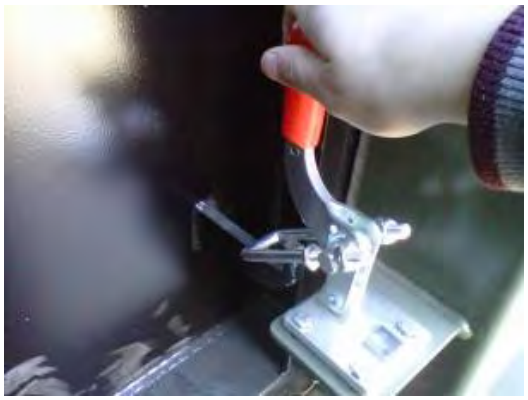
c. Visually inspect the burner hoses to ensure that there are no fuel leaks. Check to see if lines are brittle or cracked, check for any oil spills near the burner, which would indicate a leak.

d. Ensure the draft gauge hose connection is tight and sealed. This is a copper tubing located in the back upper corner of the Primary Chamber.



Draft Gauge Hose connection

e. Unlatch all four clamps on the Primary Chamber door, open and secure in the open position



f. Ensure that the Primary Chamber has been cleaned out, and the Chamber floor is cool (less than 40°C).

NOTA

If the floor is hotter than this temperature the waste may spontaneously catch on fire during loading.

g. Weigh the waste on scale and begin loading the Primary Chamber from the front (or hand bomb as required).

NOTA

In the event that some waste is loaded by hand do not deliberately throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTA

When loading the waste loading avoid contact with refractory (wall modules, door jams, sills, lintel, etc)

NOTA

Load only the waste stream that the unit has been rated for see Facility Manual Part II Section 4 Waste Processing Capabilities.

NOTA

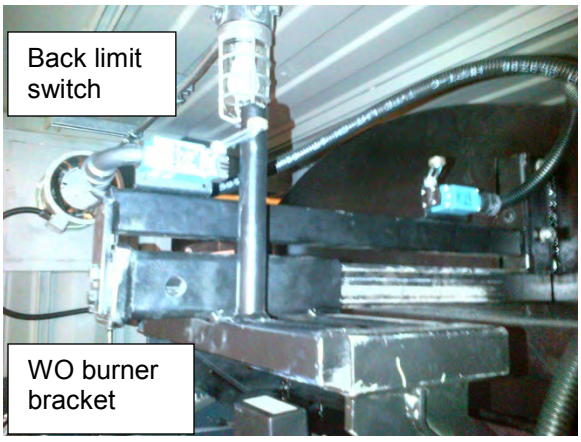
Do not load the Primary Chamber above its rated capacity by weight

NOTA

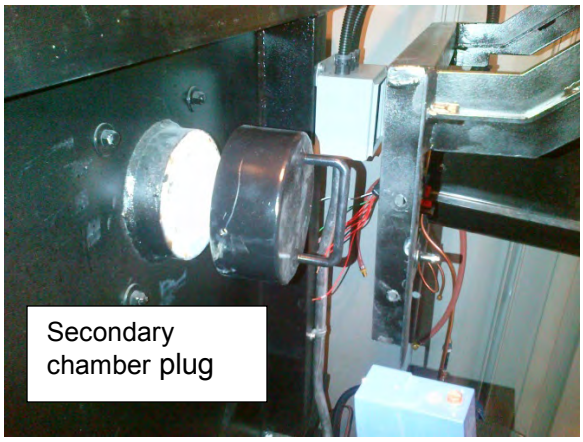
Do not load the Primary Chamber such that the breech section is blocked in any way

h. Close the Primary Chamber access door by clamping each latch until it is tight

i. Ensure that the waste oil burner is all the way out (limit switch in the back of the bracket activated), insert the waste oil plug in place and insert the locking pin to avoid burner from swinging



Waste oil all the way out limit switch made



Secondary chamber plug being installed

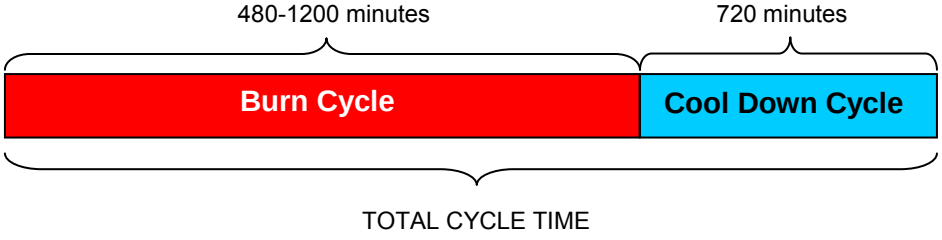
Waste oil burner secured with pin

j. Proceed to the Control Panel on the HMI Panel View, from the Top View menu choose solid waste only.

k. The burn time will be set to the previous burn, if you wish to change the set time, proceed to the Primary Status screen and click on the BURN TIME button. The minimum number of minutes you can enter is 480 (8 hours). When you have finished, the time will be displayed in minutes beside the BURN TIME button

NOTA

The burn time value (in minutes) determines the length of the burn cycle before cool down cycle starts.



Main Control Panel

l. On the Main Control Panel press “Start” on HMI (Panel View). The following steps will automatically take place, controlled by the Control Panel:

i. The Primary Blower and Secondary Blower will purge the system for 2 minutes
ii. The Secondary Burner will purge for safety, and upon completion will ignite
iii. Once the Secondary Chamber temperature reaches 1000°C, the Primary Burner will purge for safety and upon completion with ignite
iv. The Burn time will start counting down when the temperature in the Primary Chamber reaches 427°C

NOTA

The Control System will maintain proper operating conditions and will provide continuous monitoring capability

v. After the burn cycle is completed, the system will automatically enter the Cool Down cycle and the following will be shown on the system status:
- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

vi. Once fully cooled and the temperature is below 90°C, proceed to the Primary Chamber Clean Out procedures

NOTA

System drains and exhausts should discharge at atmospheric pressure. In order to prevent inaccurate readings or instrument damage, do not allow the discharge side to back up or freeze.

3.3.4.2 Clean Out

Operators responsible for loading and cleaning out incinerators shall wear appropriate protective equipment, including dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury. Although the ash from the system is considered sterile and will not contain microorganisms, it may contain a quantity of sharp objects, such as broken glass and other sharps which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out the ash and residues. Also removing the ash does create dust particles in the air. Dust shall not be inhaled. The operator shall wear dust protection safety gear.

When the internal temperature of the Primary Chamber has cooled to less than 90°C, lock out the power to the system on the Main Control Panel by moving the main disconnect to the “OFF” position.

a. Unlock all door latches on the access door to the Primary Chamber

b. While standing in front of the Primary Chamber door, slowly open the door to its fully open position. Secure Primary Door in the open position.

c. Inspect the interior for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure

d. Check the air inlet holes and remove any obstructions if necessary.

e. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb

f. Close the Primary Chamber access door by clamping each latch until it is tight

g. Clean the inspection view port (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

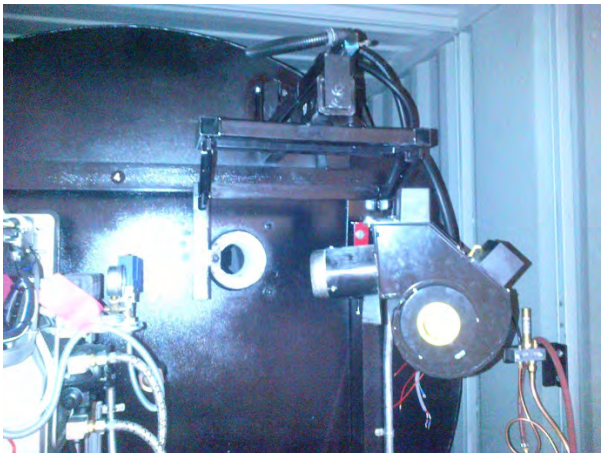
3.3.4.3 Burning Waste Oil

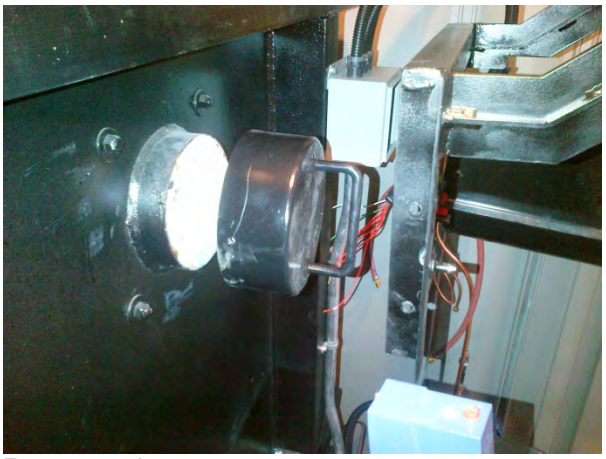
Do not use this incinerator to burn waste oil only. Always burn a complete load of solid waste when burning waste oil

a. Follow all the procedures to load the primary chamber as per procedure 3.3.4.1 above.

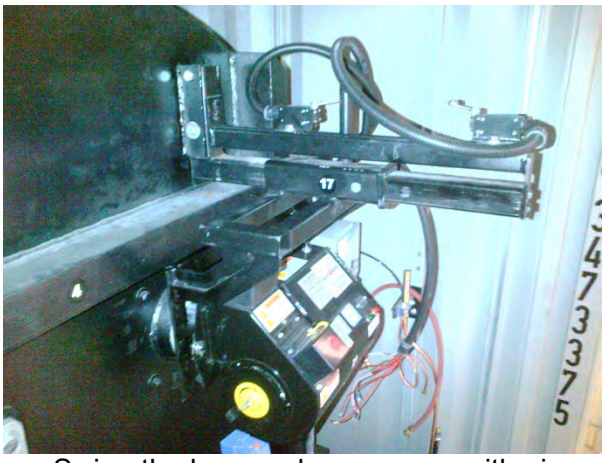
b. Ensure that the secondary chamber plug is removed, the burner cannot swing open by locking the pin and the waste oil burner is all the way in (limit switch in the front of the bracket activated).

With the burner all the way out remove pin


Swing the burner open



Remove plug



Swing the burner close, secure with pin and push all the way in until front limit switch is made

c. Proceed to the Control Panel on the HMI Panel View, from the Top View menu choose Solid Waste and Waste Oil.

3.3.5 Start up

3.3.5.1 After Shut Down (Emergency)

a. Once the power is restored main disconnect back on

b. The Operator Interface and PLC will begin a boot up procedure

c. Wait until the HMI on the control panel has booted up before turning the control power to the panel back on by pressing the Control Power ON button

d. When the power is restored to the Main Control Panel, the button should illuminate.

e. If the system was interrupted during a burn cycle, restart the system by pressing “Start” on HMI. If the system was interrupted during cool down, it will resume the cycle where it left off.

3.3.5.2 After Power Failure

a. On the main menu of the Panel View (HMI), press the Configuration Key and the application will now shut down. (This will take 1-2 minutes).

b. There will be a GREY screen with a number of Touch Buttons.

c. Press the “RUN (F1)” button on this screen.

d. The application will now restart. (This will take approximately 1-2 minutes)

e. When it is up and running, the system is now ready for operation

NOTA

In the event of a power shut down to the system, the control panel must be re-started from the HMI Panel View:

3.3.6 Dealing with Warnings and Faults

3.3.6.1 Troubleshooting

The burn cycle will not start if one of the following conditions exists

a. The Systems is in the “cool down” part of the cycle. Wait until the “cool down” cycle is complete.

b. There is a fault in the system as indicated on the Panel View.

c. Loss of Power due to any one or more of the following:

i. The main disconnect (see image) is off or there is no electrical power. Turn on the disconnect switch or check why there is no power.

ii. An open breaker. Check the breakers and replace any that are defective.

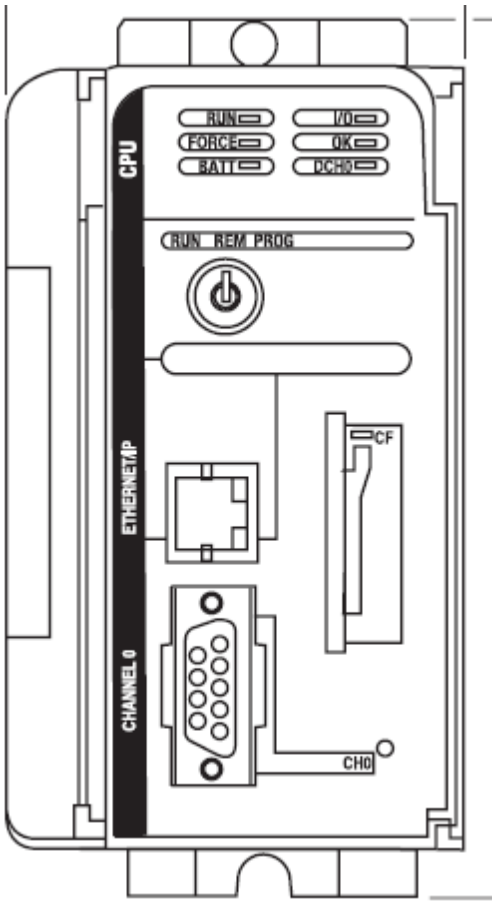
iii. The emergency stop is pushed in. Twist the emergency stop button to unlock, and then push the control power on button. The control power button should now be illuminated.

d. If on the “Top View” screen on the HMI the primary door is not closed, the door has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

e. If on the “Top View” screen on the HMI the secondary door is not closed, the door has not been shut properly. Adjust the limit switch lever arm, if necessary. Check the limit switch and that the wiring is in working order.

f. If fuel tank is low, system will not start. Tank on the HMI will be red, indicating the level is low and needs to be filled.

g. PLC Processor Problem



i. Check the run light on the PLC processor. If the run light is on, the PLC is ready.

ii. “OK light” is green = Controller is OK

iii. “OK light” is Red Flashing = this is a recoverable fault, check the PLC processor. This fault is very unlikely to occur.

iv. OK light is Red = this is a non-recoverable controller fault. Cycle Power. The OK LED should change to flashing red. If LED remains solid red, repl*ace the PLC. This fault is very unlikely to occur.*

v. *"Default Channel Zero (DCH0) light" is green = this indicates the PLC processor has lost the* program. The PLC is equipped with a flash card that will automatically load the program back onto the PLC

3.3.6.2 Possible Problems/Causes/Solutions

Problem	Causes	Solutions
Blower Fails to start	Breaker tripped	Turn power off at Main Disconnect Open Panel and check which breaker has tripped, turn back on
	Motor starters or contactor coil is burnt out	Locate contactor for blower and visually observe if the contactor is pulled in. Use a multi meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor. *See Part IV Section 4 CMI 4.4.4/01-001G*
Secondary Burner won't ignite	Bad Electrodes	*Refer to Part IV Section 2 Preventive Maintenance Instructions (PMI) 01/02-002.D.01*
	Low Oil Pressure	Adjust pressure setting on burner pump by turning the screw located at the bottom of the pump. Turn clockwise to increase pressure and counter clockwise to decrease pressure.
	Fuel Line Leak	Visually inspect the lines for the leak Tighten any fittings that are near the leak
	Door Switch not making contact	Make sure main door is closed and latched shut Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple see Section IV Part 4 CMI 4.4.1/05-002A
Primary Burner won't ignite	Bad Electrode	*Refer to Part IV Section 2 PMI 01/02-002.D.01*
	Low Oil Pressure	Adjust pressure setting on burner pump by turning the screw located at the bottom of the pump. Turn clockwise to increase pressure and counter clockwise to decrease pressure.
	Fuel Line Leak	Visually inspect the lines for the leak Tighten any fittings that are near the leak
	Door Switch not making contact or broken	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.

Problem	Causes	Solutions
	Secondary temperature not at 1000°C	Wait until Secondary temperature is at 1000°C and try again
	Burner main switch is turned off	Turn switch on
	Burner alarm has been tripped	Acknowledge burn alarm and then hit the reset button on control panel
Persistent Black Smoke	Insufficient air supply to Secondary Chamber to completely consume emissions	Check to ensure combustion air blower/damper assembly is operating properly.
	Secondary Chamber is not hot enough.	Check that the Secondary temperature is operating at required temperature set point.
	Overloading or loading highly volatile material	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Burner failure	Check burner operation – if no flame or a poor flame is visible through the flame view port adjust air/fuel ratio
	Operation at too high a Primary Chamber temperature	Check/decrease primary chamber combustion air
Smoke coming out of Primary	Too much air	Check dampers on primary blower
	Too much volatile material loaded	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value
Too much fuel usage	Too much secondary combustion air	Check/reduce secondary combustion air
	Too much air infiltration	Reduce air flow by adjusting the damper
	Fuel leakage	Check fuel trains and burners for fuel leakage
	Wet waste	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time
	Excessive draft	Check/reduce draft – check door seals and other seals for leakage adjust damper
	Burner setting too high	Check air/fuel mix
Waste Oil Burner		
Pump fails to start	Breaker tripped	Switch Breaker into off position and then switch to on position again. If breaker continues to trip, check for short in the system.
	Motor Starter	Check motor starter
	Overload	Reset overload

Problem	Causes	Solutions
Waste Oil Nozzle not turning on	A ball valve is closed	Ensure all ball valves are open.
	Solenoid Valve has failed	Diagnose if valve has failed. Replace if necessary See Part IV Section 4 CMI 4.4.5/02-003B (page 451)
	Fuel Leak	Check all pipes and hoses
	Secondary Chamber not at temperature	Wait until Secondary Chamber reaches 982°C.
System will not start when Solid is selected	Waste Oil burner is inserted into the back of the Secondary Chamber	Remove Waste Oil burner assembly from the Secondary Chamber.

3.3.6.3 In Case of Alarm

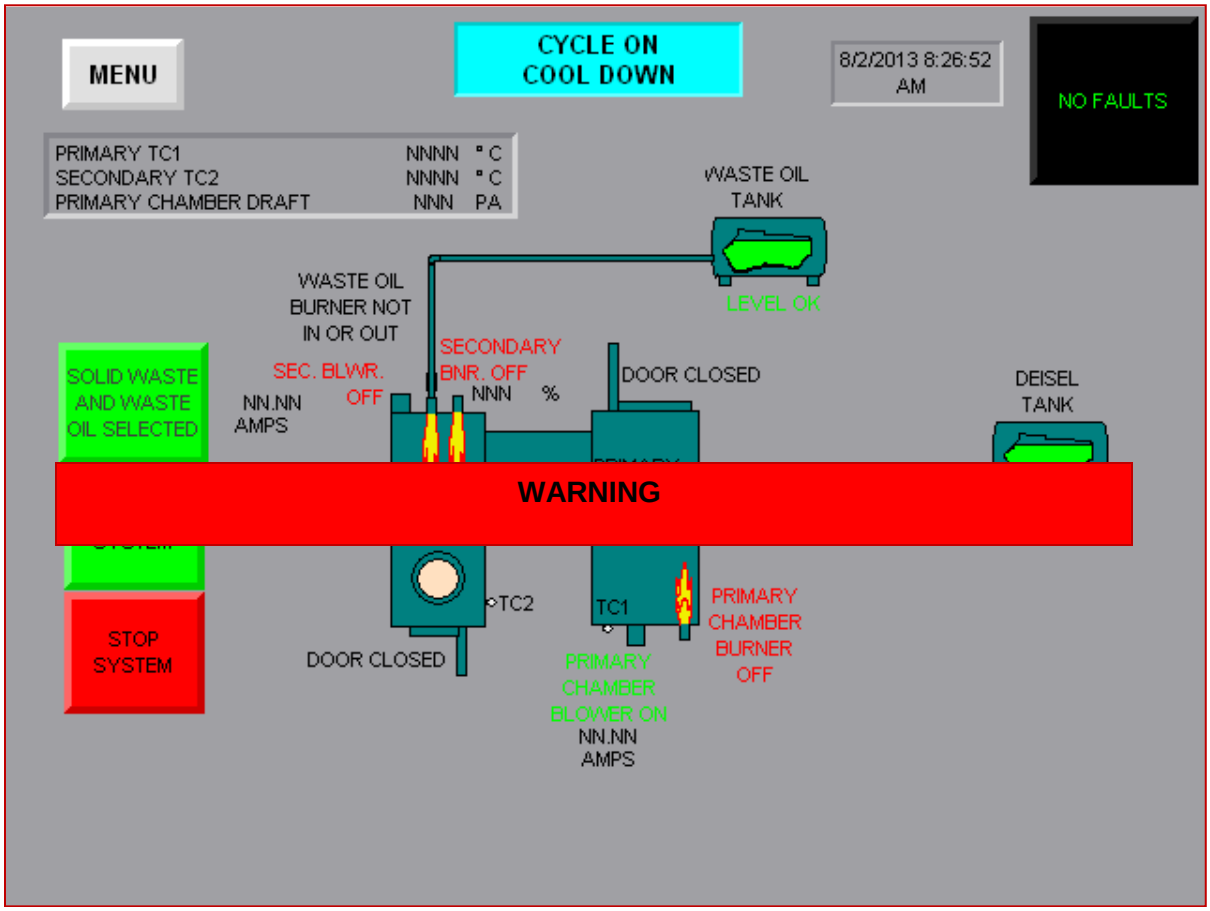
IF BURN IS IN PROGRESS DO NOT HIT EMERGENCY STOP BUTTON ON MAIN CONTROL PANEL.

a. Go to the manual slide gates on the Primary Chamber, located just after the blower, and close them all the way. This will help to put the fire in the chamber out.

b. Check alarms to see what the problem is.

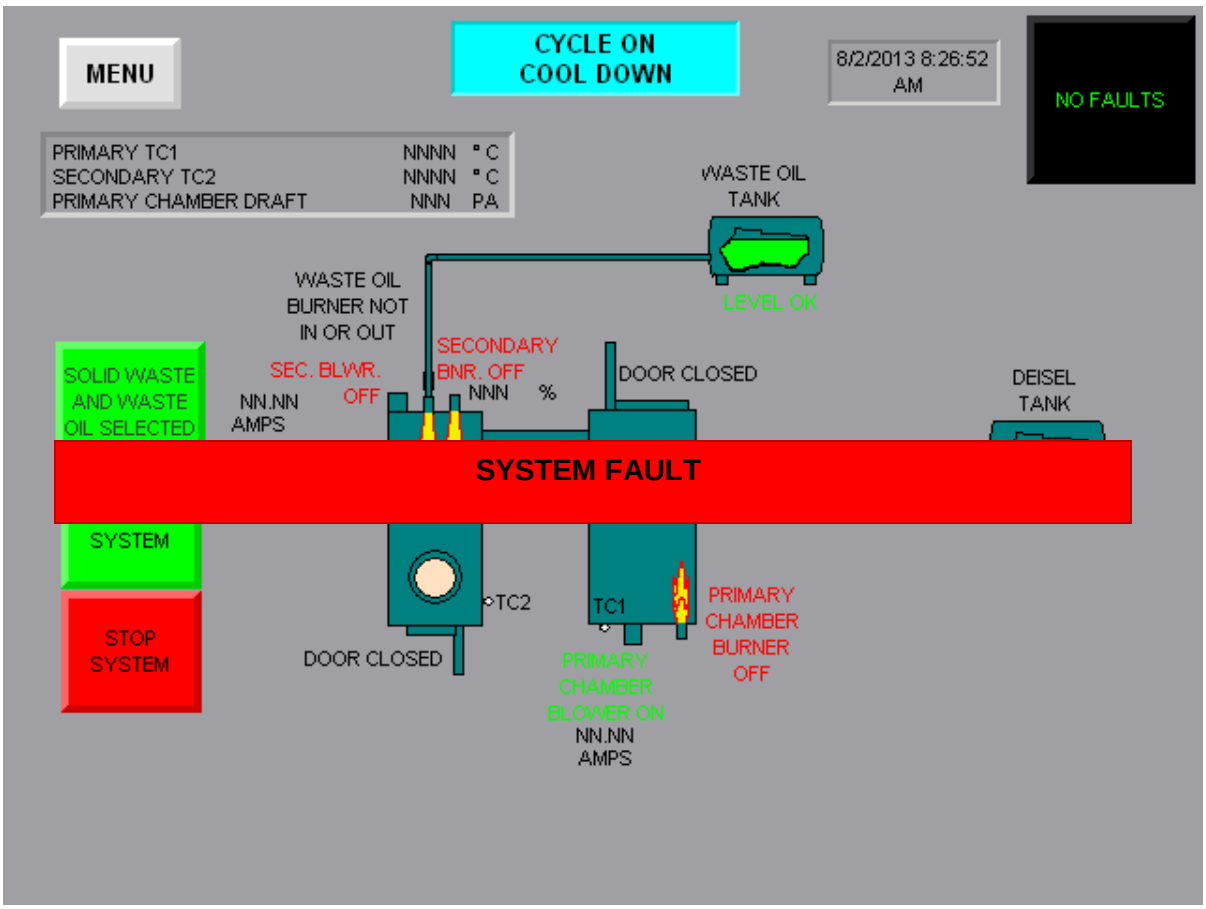
c. Do not open the doors of the Primary Chamber unless the temperature inside the chamber is below 90°C

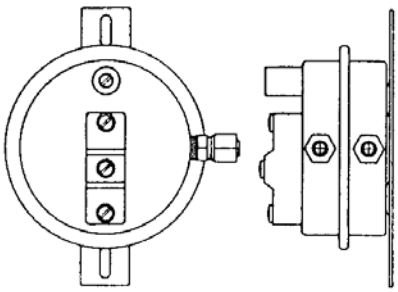
3.3.6.4 System Warnings

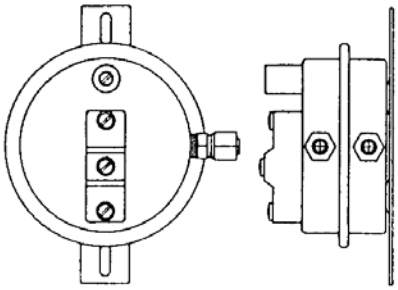


Warnings indicate that a non critical value or device has malfunctioned and requires an operator to review what may be causing this to occur. If not resolved some of the warnings may become a fault.

3.3.6.5 System Faults



ALARM	SOLUTION
The Primary Chamber thermocouple has faulted	Refer to *Part IV Section 2 PMI 05-002.W.01*
The Secondary Chamber thermocouple has faulted	Refer to *Part IV Section 2 PMI 05-002.W.01*
The primary burner is faulted	The primary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner and look into sight glass for ignition:
	Check that the pressure is 1378 kPa
	If a spark is present and burner won't ignite: • Check fuel lines for leaks • Check that fuel pump is not clogged
	If no spark is present: • Clean electrodes
The secondary burner is faulted	The secondary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner and look into sight glass for ignition:
	If a spark is present and burner wont ignite: • Check fuel lines for leaks • Check that fuel pump is not clogged
	If no spark is present: • Clean electrodes
The system has shut down due to primary blower low air flow.	Visually examine the primary blower for any obstructions that may be causing low air flow
	Check slide gate located between Primary chamber and blower, ensure it is open.
	Check damper assembly, ensuring modutrol crank arm is still connected and that butterfly damper is open, allowing air flow.
	Air proving switch may be defective. See *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
	There are two ports on the air proving switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked
	If no air restriction is observed (i.e. blockage in the tube) change the air proving switch see *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
The primary blower motor breaker is tripped or open.	Turn power off on Control panel by turning the Main Disconnect to the off position CB1

ALARM	SOLUTION
	Open the main control panel and switch break switch to off and then to the on position “CB9”
The system has shut down due to secondary blower low air flow.	Visually examine the primary blower for any obstructions that may be causing low air flow
	Check slide gate located between Secondary chamber and blower, ensure it is open.
	Check damper assembly, ensuring modutrol crank arm is still connected *(if not see Part IV Section 2 PMI 01/02-001.W.01 Damper Crank Arm)* and that butterfly damper is open, allowing air flow.
	Air proving switch may be defective. See *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
	There are two ports on the air proving switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked
	If no air restriction is observed (i.e. blockage in the tube) change the air proving switch see *Part IV Section* 4 CMI 4.4.4/01-001A & 02-002A
The Secondary blower motor breaker is tripped or open.	Turn power off on Control panel by turning the Main Disconnect to the off position
	Open the main control panel and switch the breaker to off and then to the on position “CB10”
The Secondary blower variable frequency drive is faulted.	Push fault reset button on the Panel view
	If fault persist check the error code on the variable frequency drive and check OEM manual for troubleshooting alarm.
The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself
	If alarm persist replace the low level switch *as per* See *Part IV Section* 4 CMI 4.4.3/01-002G & 02-002G
Selected Solid & Waste Oil The waste oil burner is not in.	Check to see if the waste oil burner is pushed all the way into the Secondary Chamber. • Push waste oil burner all the way in, ensuring it makes contact with the limit switch • If the waste oil burner is all the way in and making contact with the limit switch, replace the limit switch. See Part IV Section 4 CMI 4.4.1/05-005A (page 436)

ALARM	SOLUTION
Solid Waste Only Selected The waste oil burner is not out.	Check to see if the waste oil burner is pulled all the way out of the Secondary Chamber • Pull waste oil burner all the way out, ensuring it makes contact with the limit switch • If the waste oil burner is all the way out and making contact with the limit switch, replace the limit switch. See Part IV Section 4 CMI 4.4.1/05-005A (page 436)
The waste oil burner is faulted.	The waste oil tank is empty, fill tank
	Check that the instrument air is going to the burner check the air pressure gauge on the burner and adjust regulator if necessary.
	Check that the fuel pump is in working condition
	Check that the waste oil breaker is not tripped “CB15”

4.0 MAINTENANCE INSTRUCTIONS

4.1 SUMMARY OF PREVENTIVE MAINTENANCE INSTRUCTIONS

IF APPLICABLE: The air compressor pump is shipped with break-in oil which should be changed after the first 8 hours of operation.

4.1.1 Daily Maintenance

Freq.	Routine	Component	Description
Daily	Inspection & Cleaning	Burners	Clean electrodes & HT Leads.
Daily	Inspection & Cleaning	Burners	Inspect fuel lines for leaks.
Daily	Inspection & Cleaning	Burners	Inspect nozzles in burners.
Daily	Inspection & Cleaning	Refractory	Check inside the Chambers for shrinkage or any exposed metal.

4.1.2 Weekly Maintenance

Routine	Component	Description
Inspection & Cleaning	Air compressor	Check oil level
Inspection & Cleaning	Air compressor	Check air filter
Inspection & Cleaning	Air compressor	Pull ring on safety valve and allow the ring to snap back to normal position (Check for free operation of the safety valve)
Inspection & Cleaning	Blowers and Assembly	Modutrol crank arm connected to damper.
Inspection & Cleaning	Blowers and Assembly	Slide gates are open.
Inspection & Cleaning	Burners	Clean photocell / UV Detector
Inspection & Cleaning	Burners	Clean the glass on the flame inspection window.
Inspection & Cleaning	Burners	Check diffuser disc.
Inspection & Cleaning	Waste Oil Burner Filter	Clean the canister filter
Inspection & Cleaning	Thermocouples	Remove and clean thermocouples as necessary – inspect for damage. Replace if necessary.

4.1.3 Monthly Maintenance

Routine	Component	Description
Inspection & Cleaning	Air compressor	Check all fasteners for proper tightness.
Inspection & Cleaning	Blowers and Assembly	Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures
Inspection & Cleaning	Burners	Check flexible hoses to make sure that they are still in good condition.
Inspection & Cleaning	Burners	Pump delivery pressure must be stable. If the pressure is found to be unstable or if the pump runs noisily see manual for details.
Inspection & Cleaning	Burners	Check that no dust has accumulated inside the fan or on its blades.
Inspection & Cleaning	Burners	Check that all parts of the combustion head are in good condition, positioned correctly, free of all impurities, and that no deformation has been caused by operation at high temperatures.
Inspection & Cleaning	Refractory	Check the refractory in the Secondary Chamber for shrinkage, anything greater then 1.2cm should be patched (i.e. gaps between modules exposing metal surface)
Inspection & Cleaning	Waste Oil	Visually check all electrical components
Inspection & Cleaning	Waste Oil	Remove heater element from casing and inspect for build-up. Clean any deposits. When reinstalling the heater element always ensure the bundle will be restarted immersed. NEVER use the inline oil heater dry

4.1.4 Quarterly Maintenance

Routine	Component	Description
Lubrication Service	Air compressor	Change the oil
Inspection & Cleaning	Blowers and Assembly	Lubricate all bearings – lubrication intervals depend on operating speed (RPM). Clean cooling fan on motors.
Inspection & Cleaning	Blowers and Assembly	Check the V-belt drive (Secondary Blower) for proper alignment and tension (see manual). If belts are worn, replace them as a set, matched within manufacturer's tolerances.
Inspection & Cleaning	Burners	Check all components for heat damage.
Inspection & Cleaning	Refractory	Inspect door gasket for damage or heat damage. Replace segments, if necessary. Doors must close tightly and securely.
Inspection & Cleaning	Refractory	Check all refractory for damage. Patch or replace as needed. Patch if modules show a little gap and replace modules if the modules have shrunk excessively (greater than 1")
Inspection & Cleaning	Paint	Maintain paint exterior to protect metal from heat damage

4.1.5 Yearly Maintenance

Routine	Component	Description
Detailed Maintenance	Refractory	Replace door gasket
Inspection & Cleaning	Electrical	Check the limit switch

4.1.6 Level 2 and Level 3 Maintenance

Please refer to the OEM Manual for additional information regarding maintenance instructions for Level 2 and Level 3.

Periodicity	Level of Repair	Routine	Component	Description
24 Monthly	3	Detailed Maintenance	Refractory	Replace the door sills on Primary Chamber
24 Monthly	3	Detailed Maintenance	Refractory	Replace the door sills on Secondary Chamber
60 monthly	3	Detailed Maintenance	Refractory	Relining of Secondary Chamber.
60 monthly	3	Detailed Maintenance	Refractory	First stack section to be relined.
60 monthly	3	Detailed Maintenance	Fuel Tanks	Inspect Fuel tanks

4.2 PREVENTIVE MAINTENANCE INSTRUCTIONS

The following preventive maintenance instructions (PMI) are to be read in conjunction with the IPDs found in Section 4.3.

4.2.1 Instruction Classification

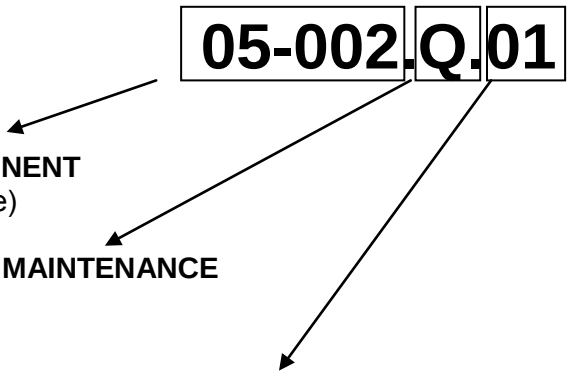
Each component is associated with an identification number, see table below:

System Component	Identification number
Primary Blower	01-001
Secondary Blower	02-001
Primary Burner	01-002
Secondary Burner	02-002
Air Compressor	03-001
Waste Oil Burner	02-003
Main Control Panel	03-010
Refractory	05-001
Thermocouple	05-002
Paint	05-003
Electrical	05-004
Limit Switch	05-005

To differentiate if the instruction is weekly, monthly, quarterly or yearly, the above identification number will be followed by a letter:

Daily:	D
Weekly:	W
Monthly:	M
Quarterly:	Q
Yearly:	Y

For example**,**



SYSTEM COMPONENT
(eg. Thermocouple)

FREQUENCY OF MAINTENANCE
(eg. Quraterly)

MAINTENANCE INSTRUCTION NUMBER
(eg. Maintenance Routine #1)

4.2.2 Zero Mechanical State & Lock Out Instructions

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS model Incinerator. The preventive maintenance instructions are outlined in this section of the Facility Manual.

NOTA
The warranty will become void if proper maintenance is not performed as instructed.

4.2.2.1 Safety

During maintenance of the EWS mobile incinerator, it is very important to be aware of special hazards. Two safety programs are described in the following sections:

1. Zero Mechanical State
2. Power Lock Out Instructions

Failure to comply with these instructions during maintenance could result in injury or death. The responsibility for implementation of a comprehensive safety program rests with the operating staff and supervision. The safety instructions in this Facility Manual should be considered only as a starting point for the safety program at site.

ACCIDENTS CAN BE PREVENTED
A CAREFUL WORKER IS THE BEST SAFETY DEVICE

4.2.2.2 Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is mandatory to totally deactivate the incinerator so that there is no possibility of an unexpected machine movement. Power lock-out, described in the next section, is commonly used for this purpose. Most machines are powered by electrical, hydraulic or pneumatic drives. Energy may be stored in a shutdown machine in various ways: Air pressure in a cylinder, hydraulic fluid stored in pressurized hoses, or machine members whose weight can generate fluid pressure. Therefore, just cutting off the electrical power may not be enough to neutralize all power sources. Certain maintenance instructions at site should require ZMS condition as a matter of course.

4.2.2.3 Zero Mechanical State (ZMS) Checklist

1. Every electrical power source to the incinerator must be cut off and locked out (to prevent others who may not be aware of maintenance work from turning the power back on inadvertently).
2. Ensure that the mechanical potential energy of the incinerator is at its lowest practical value so that opening of pipe, tubing, hose or actuation of any valve will not produce an unexpected movement that could cause injury.

3. Check that there is no pressurized fluid (air, oil, gas or other) trapped in the incinerator lines, cylinders or other components. This will ensure that there will be no incinerator motion when a valve is actuated.

4. Secure loose or freely moving parts so that there is no possibility of accidental movement.

4.2.2.4 Power Lock Out Instructions

Unexpected operation of electrical equipment started by automatic or manual remote control may cause injuries to persons who happen to be nearby. For this reason, when repair work is to be done on motors or other electrical equipment the circuit should be opened at the switch box and the switch pad locked in the OFF position. Tag the switch with a lock out tag indicating who must be contacted before the power is turned back on again.

BECAUSE OF THE SEVERE CONSEQUENCES, INCLUDING DEATH, OF NOT PROPERLY LOCKING OUT ELECTRICITY SUPPLIES DURING MAINTENANCE, THE SUPERVISOR SHOULD ENSURE THAT THERE IS ONLY 1 KEY FOR THE LOCK USED TO LOCK OUT THE POWER SUPPLY.

For identification, locks may be color coded to indicate different crews or shifts.

The Supervisor should maintain the master key and list of key numbers, and should keep an extra key to each lock for his department. The master key should not be loaned out under any circumstances.

No matter what method is used to lock out power, strict discipline and constant supervision should be employed during any equipment maintenance work.

4.2.2.5 Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine, motor, line shaft or other power transmission equipment or power-driven machine, make sure it cannot be set in motion without your knowledge.

3. Place your own padlock on the control switch, lever, or valve, even if someone has locked the control panel before you. You will not be protected unless you put your own padlock on it. (Another maintenance person could remove their lock and then someone else could start the equipment if they were not aware of maintenance work being done.)

When you are finished working, remove your own padlock. Never permit someone else to remove it for you. Be sure you are not exposing someone else to danger by removing your padlock.

4.2.3 Daily Instructions

Primary & Secondary Chamber Burners: (01-002.D & 02-002.D)

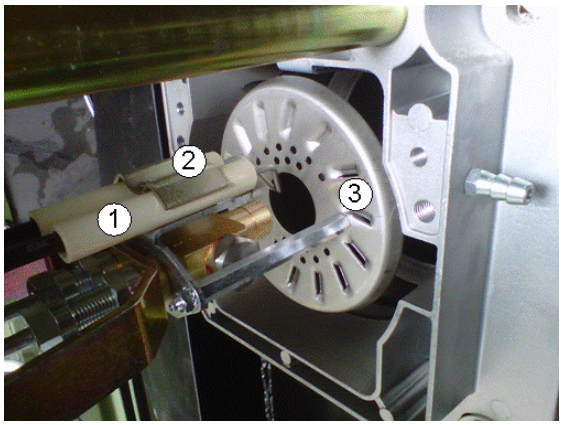
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

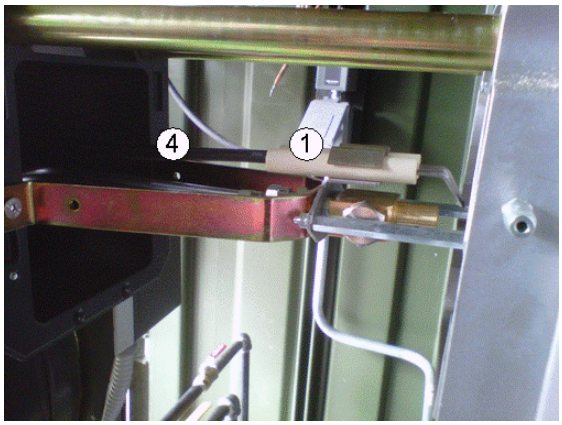
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/02-002.D.01: INSPECTING AND CLEANING ELECTRODES AND HT LEADS

1. Remove the cover from the Burners as described in 01-002.W.01 and 02-002.W.01.
2. Inspect the electrodes for any soot build-up.



1. Electrode
2. U-bolt
3. Diffuser Disc

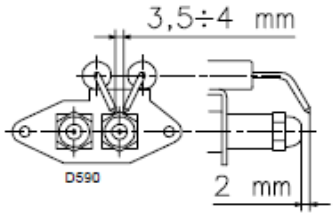


4. HT Leads

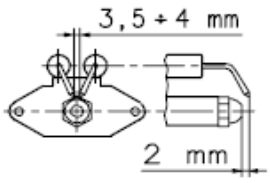
3. Clean/wipe down the ignition electrode with a cloth should there be a build-up of soot.

NOTA Do not use sand paper as this will increase the deposit of future soot.

4. If electrodes are damaged remove the screws and u-bolt (see above photo) and install new electrodes. When reinstalling the electrodes make sure that they are positioned as shown below.
5.



Primary Burner



Secondary Burner

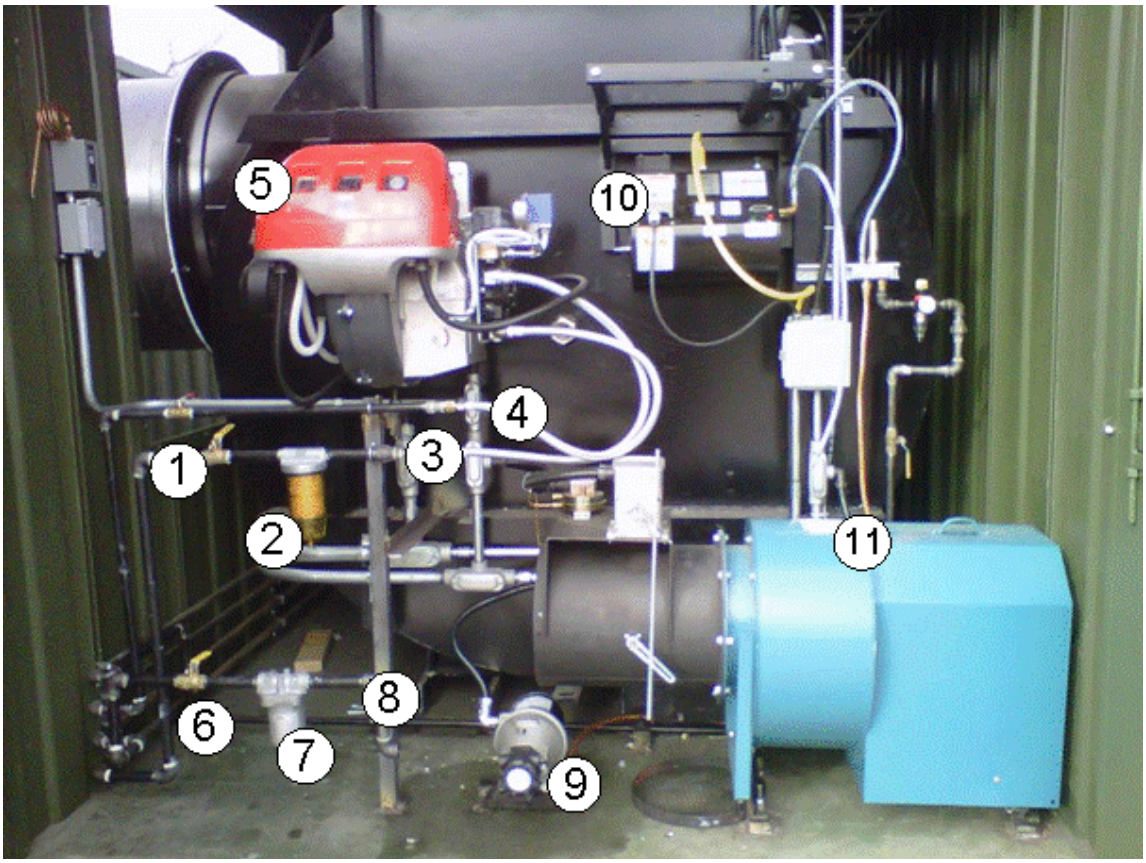
Check the High Temperature (HT) Leads for any heat damage. If HT Leads are severely damaged (i.e., you can see the wire beneath the sheathing) then replace. (See *Part IV Section 4 CMI 4.4.3/01-002A & 4.4.3/02-002A)*

INSTRUCTION 01/02-002.D.02: INSPECTING THE FUEL LINES

1. Visually inspect all fuel lines to the Primary and Secondary Burner as well as to the Waste Oil burner for any leaks.

2. The Primary and Secondary Burner have two oil lines, one feed and one return. The Waste Oil Burner only has one feed line.

3. If any leaks are observed tighten or replace the fitting where the leak is occurring



1. Fuel In Ball Valve
2. Fuel Filter
3. Fuel Line In
4. Fuel Line Out
5. Secondary Burner
6. Waste Oil Ball valve
7. Waste Oil Filter
8. Waste Oil Line In
9. Waste Oil J-pump
10. Waste Oil Burner
11. Secondary Blower

INSTRUCTION 01/02-002.D.03: INSPECT AND CLEAN BURNER NOZZLES

Primary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the centre retaining bolt.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary

Secondary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the 4 retaining bolts on either side of the burner.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary

Refractory: (05-001.D)

When working with the refractory make sure you use the proper tools; wear goggles, approved dust mask and gloves

INSTRUCTION 05-001.D.01: INSPECTING THE REFRACTORY

Ensure power is locked out.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

1. Open Primary Chamber door by unlatching all four clamps.

2. Tie-off door to open position to ensure that it will not close unintentionally.

3. Enter Primary Chamber and check the refractory for shrinkage, any gap between the modules greater than 2.5 cm should be patched with the blanket refractory

4. Check for any exposed metal between the modules, if metal is exposed make sure to patch area with blanket material or new module (*Part IV Section 4 CMI 4.4.2/05-001A & 4.4.2/05-001B)*

4.2.4 Weekly Instructions

Primary & Secondary Chamber Blowers: (01-001.W & 02-001.W)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

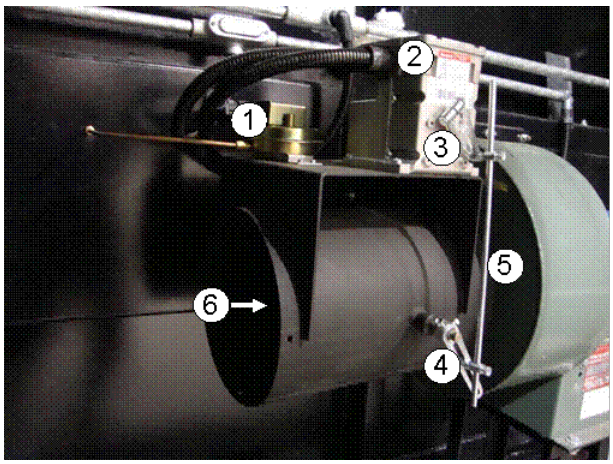
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

The rotating assembly should be blocked securely before attempting maintenance of any kind.

INSTRUCTION 01/02-001.W.01: DAMPER CRANK ARM

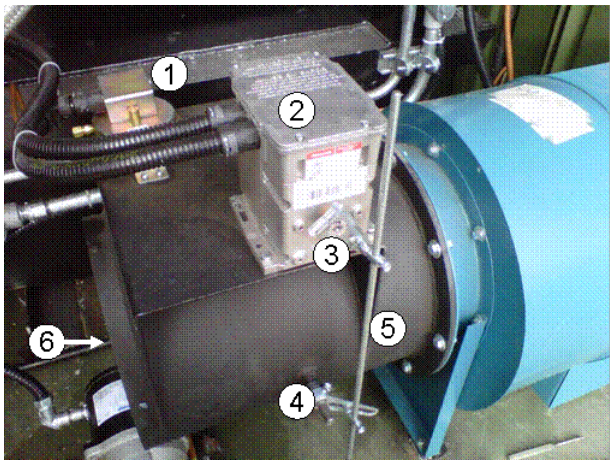
Check to see that the damper crank arm is connected to the damper and the rod.

Ensure mechanical linkage on damper is tight, if loose tighten with wrench.



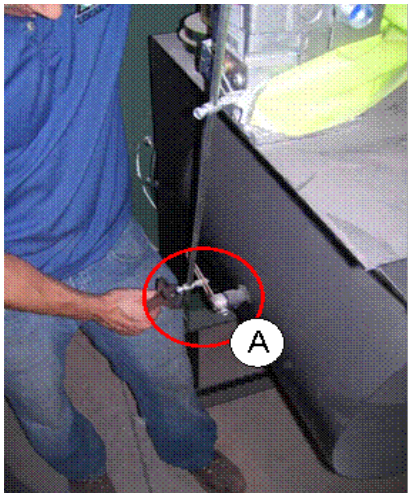
PRIMARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



SECONDARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



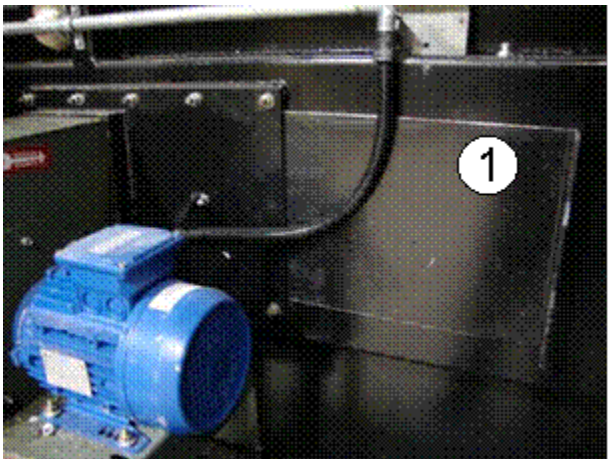
A. Damper Crank arm and connection to Damper and Rod

INSTRUCTION 01/02-001.W.02: SLIDE GATES

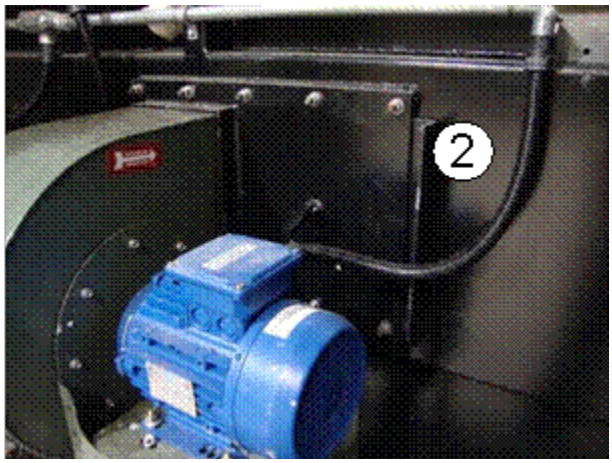
Check to see if slide gates move freely.

1. Move slide gate in and out to ensure free movement. If sticking, use lubricant to loosen. Lubricant should be rated for a high temperature (>150°F) application.

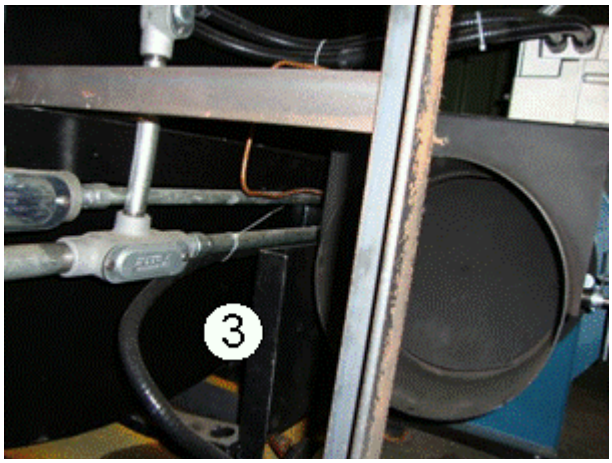
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary & Secondary Chamber Burners: (01-002.W & 02-002.W)

 **Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/02-002.W.01: REMOVAL OF BURNER COVERS

Switch off the electrical power. Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on burners.

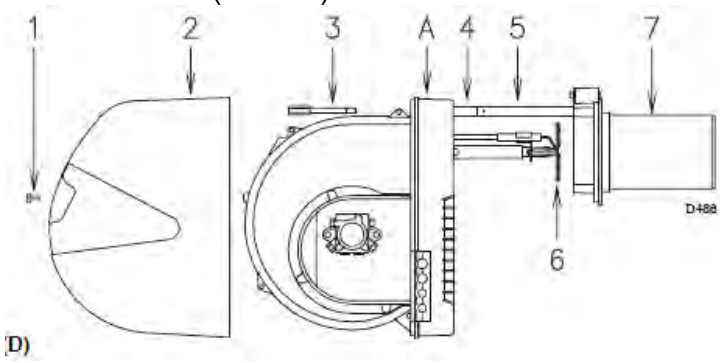
To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

1. Loosen screw (Item #1, in the following diagrams) and withdraw the cover (Item #2, in the following diagrams)

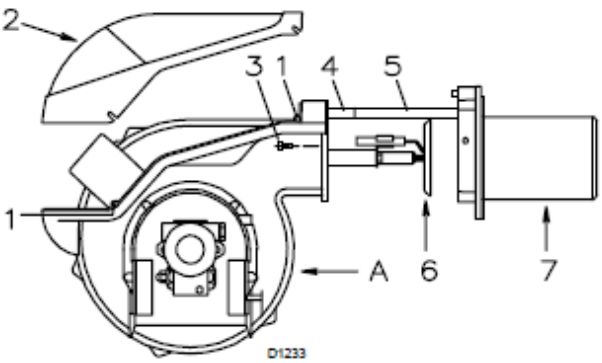
2. Primary Burner has one screw to remove the cover. The Secondary Burner has four screws to remove the cover.

3. Remove bolt (Item #3) for the Primary Burner, or screws (Item #3) for the Secondary Burner.

4. Pull (Part A) backwards keeping it slightly raised to avoid damaging the diffuser disk (Item #6).



Primary Burner has 1 screw



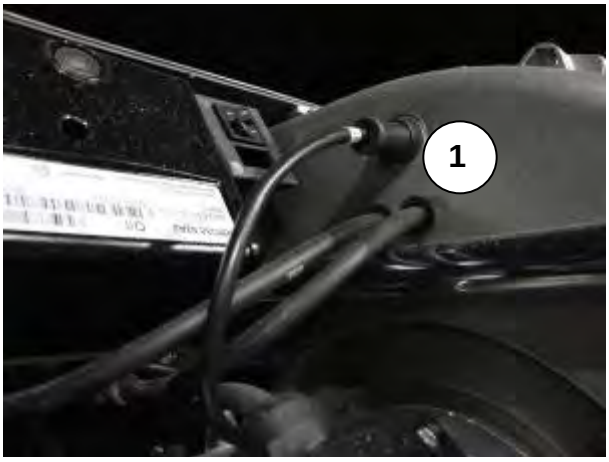
Secondary Burner has 4 screws (2 on each side)

Primary

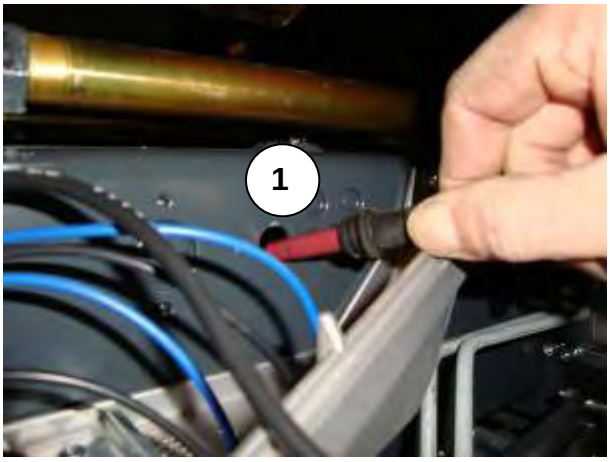
Secondary

INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO CELL AND U.V. DETECTOR

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth
3. P.E. cell (Item #1 on the Primary Burner photo) (Item #1 on the Secondary Burner photo) can be removed by pulling it outward forcefully. Ensure you take note of the position of the eye while removing, this will help when reinstalling.
4. Once cleaned insert P.E. cell back into position ensuring the eye is not facing directly into the chamber (where the flame will be) but on the same angle as before it was removed.
5. Reinstall burner cover.



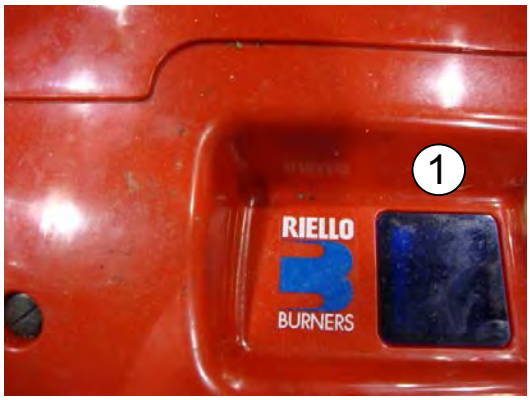
Primary Burner PE Cell

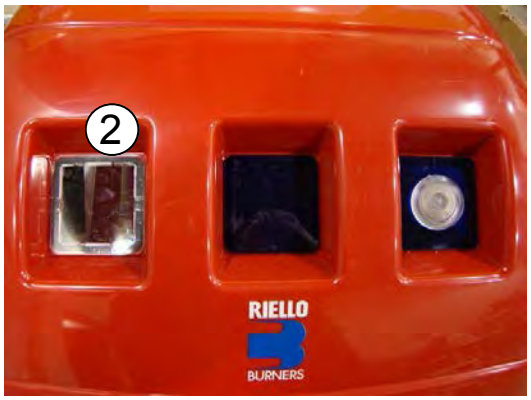


Secondary Burner

INSTRUCTION 01/02-002.W.03: CLEANING THE INSPECTION WINDOWS

Clean the inspection windows with a wet cloth.

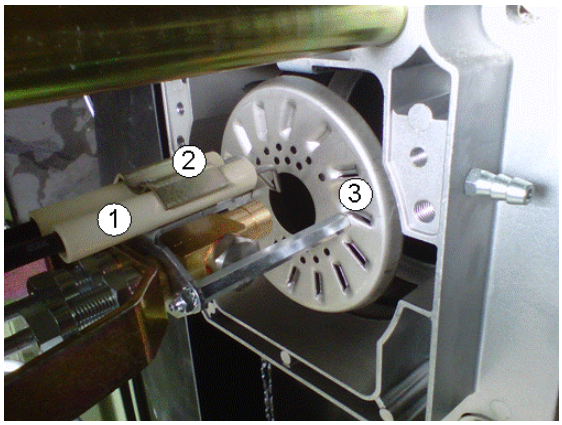




1. Primary Burner Inspection Window
2. Secondary Burner Inspection Window

INSTRUCTION 01/02-002.W.04: INSPECTING THE DIFFUSER DISC ASSEMBLY

1. Remove the cover from the Burners as described in 01/02-002.W.01.
2. Check the diffuser disc assembly and the diffuser disc for any heat damage
3. If any heat damage, deformation or excess rust is noted, replace. (*Part IV Section 4 CMI 4.4.3/01-002B)*



1. Electrode
2. U-bolt
3. Diffuser Disc

Air Compressor: (03-001.W)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not touch hot compressor or tubing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct the air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

Before maintenance is performed on electrical or rotating equipment make sure that the appropriate electrical disconnects are locked out/tagged out. Before removing the vessel access ports make sure that the equipment is off and cool.

NOTA
Too much or too little oil will harm the compressor.

INSTRUCTION 03-001.W.02: INSPECTING AIR FILTERS IN AIR COMPRESSOR

1. Remove both filter covers
2. Gently grab filter element and remove.
3. Visually inspect filter for damage or dirt.
4. If damaged, replace the filter. If dirty, blow out the filter with compressed air.
5. Reinstall the filters and their covers

INSTRUCTION 03-001.W.03: CLEANING AIR COMPRESSOR & CHECKING SAFETY VALVE

Cleaning

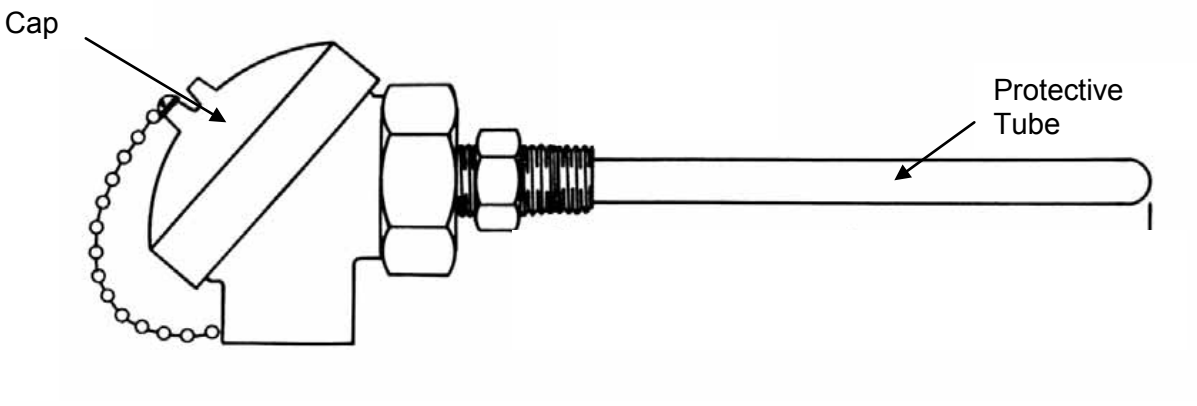
A dirty compressor will cause abnormally high temperature and result in oil carbonization on valve components. Clean all external parts of the compressor with compressed air. Concentrate the cleaning on the external fins where dirt can accumulate as cooling air is forced across them.

Check Safety Valve

1. Check the safety valve manually by pulling ring or lever to make sure that it moves freely and is not siezed.
2. Allow the ring to snap back to normal position.

Thermocouple: (05-002.W)

When working with electrical components, ensure lock out instructions are being followed.

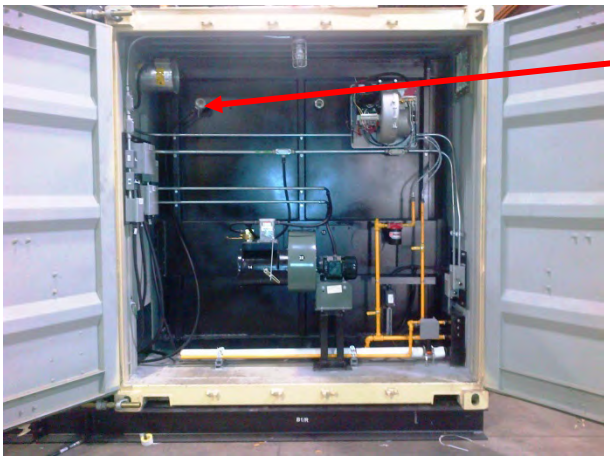


Thermocouple Assembly

Thermocouple Element

INSTRUCTION 05-002.W.01: INSPECT THERMOCOUPLE FOR DAMAGE

Turn main power to the system off - Remove thermocouple and visually inspect for damage. If damaged, see *Part IV Section 4 CMI 4.4.1/05-002A*



1. Primary Thermocouple (TC1)

2. Secondary Thermocouple (TC2) on Secondary Chamber Container

4.2.5 Monthly Instructions

Primary & Secondary Chamber Blowers: (01-001.M & 02-001.M)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.M.01: CHECK FAN WHEEL

1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures, if left in operation.
2. The wheel can be accessed one of two ways.
   a. Remove the blower assembly from the unit and look down the outlet of the blower.
   b. Remove the damper assembly from the inlet of the blower and inspect by looking through the inlet of the blower.
3. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards.
4. Clean the wheel as required.
5. If replacement is necessary follow these steps:

   a. Remove damper assembly from the unit

   b. Remove the blower assembly

   c. Remove the blower housing around the wheel

   d. Loosen all set screws that are located on the wheel.

   e. A puller may be required if the wheel hasn't been removed for some time.

   f. Ensure the shaft "key" is installed on the shaft before installing the new wheel.

   g. When installing a new wheel, the wheel should be positioned in the housing with the correct spacing between the edge of the inlet cone and the wheel. The wheel to cone clearance on the Primary Blower is 0.3175 cm.

   h. Ensure that the wheel is installed securely before reassembling the blower assembly.

   i. Install the blower assembly

   j. Install the damper assembly

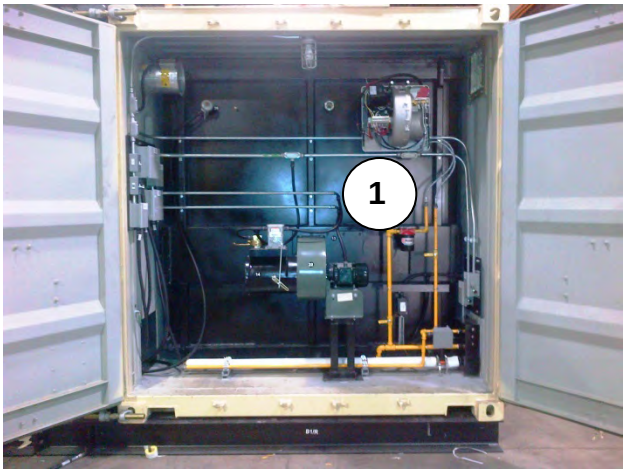
Primary & Secondary Chamber Burners: (01-002.M & 02-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

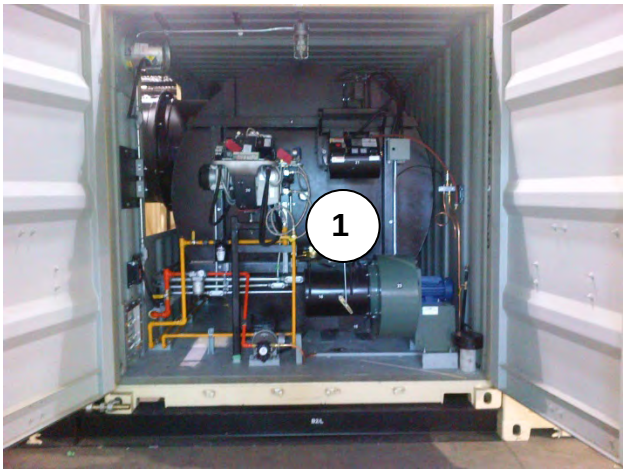
INSTRUCTION 01/02-002.M.01: CHECK FLEXIBLE OIL LINE

1. Check flexible oil lines to make sure that they are still in good condition. This includes frayed, leaking, or worn swivel joints.

2. If any type of damage is observed replace the flexible oil lines see *Part IV Section 4 CMI 4.4.3/01-002F & 4.4.3/02-0002F*



Primary Chamber Burner Flexible lines (1 Above)



Secondary Chamber Burner Flexible Lines (1 Above)

INSTRUCTION 01/02-002.M.02: INSPECT BURNER PUMP DELIVERY PRESSURE

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. The pump delivery pressure must be between 180-210 psi, and can be viewed on the gauge shown below.

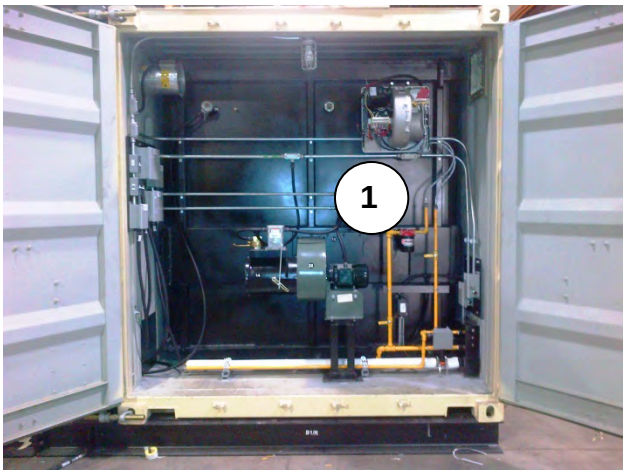
3. If the pressure is found to be unstable or if the pump is running noisily try the following:

a. Detach the flexible hose from the line filter (Shown below as #1).

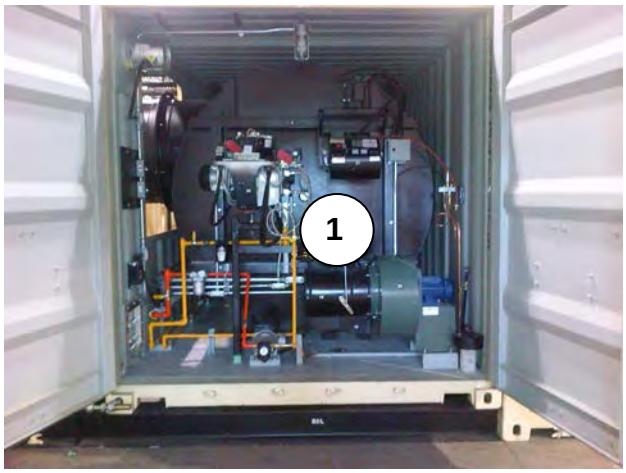
b. At the tank pour fuel into the supply line.

c. If there is fuel coming in through the filter it means the filter is not clogged. If no fuel is coming through the filter remove and replace.

d.



Primary Chamber Burner Flexible lines



Secondary Chamber Burner Flexible Lines

4. If the pump is found to be responsible:
   a. Loosen the bleed screw.
   b. Turn on the burner
   c. Once all the air has been bled out. Close the bleed screw.

   If the pump is still not working after these steps replace the pump: see *Part IV Section 4 CMI 4.4.7/01-002I or 4.4.7/02-002I.*

5. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping from a loose fitting or damaged line.

INSTRUCTION 01/02-002.M.03: CLEAN BURNERS OF DUST

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. Check that no dust has accumulated inside the burner fan or on fan blades.

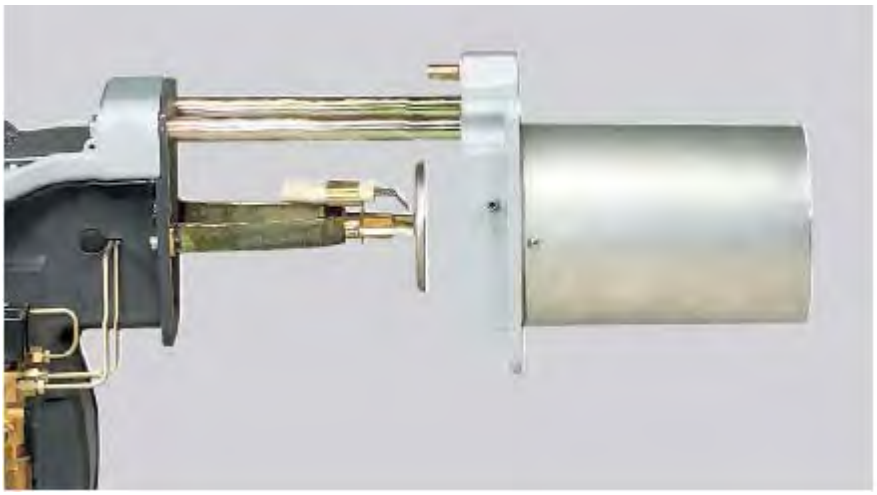
3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

INSTRUCTION 01/02-002.M.04: CHECK BURNER COMBUSTION HEAD

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. Check that all parts of the combustion head are in good condition, free of all impurities, and that no deformation has been caused by operation at high temperatures.

(Below is an example of burner in good condition)



If damage is found, please refer to *Part IV Section 4 CMI 4.4.3/01-002D* & *4.4.3/02-002D*

Refractory: (05-001.M)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.M.01: INSPECT REFRACTORY

1. Ensure power is locked out.
2. Open Secondary Chamber door.
3. Fasten door open, ensuring it will not close by its own weight.
4. Enter Secondary Chamber and check the refractory for shrinkage, any gaps between the modules greater than 2.5 cm should be patched.
5. Fix gaps with supplied blanket by stuffing material into opening. (See *Part IV Section 4 CMI 4.4.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *Part IV Section 4 CMI 4.4.2/05-001A* & *4.4.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.

Some cracking is normal, however if pieces are missing or have fallen out, (See *Part IV Section 4 CMI 4.4.2/05-001E)*

Air Compressor: (03-001.M)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Compressor must be connected to properly grounded circuit. Do not operate compressor in wet conditions. Store indoors.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air-stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

INSTRUCTION 03-001.M.01: CHECK FASTENERS FOR TIGHTNESS

1. Check all fasteners for tightness (tighten as required).

2. Check the safety valve manually, by pulling ring or lever, to make sure that it is not stuck. Allow the ring to snap back to normal position

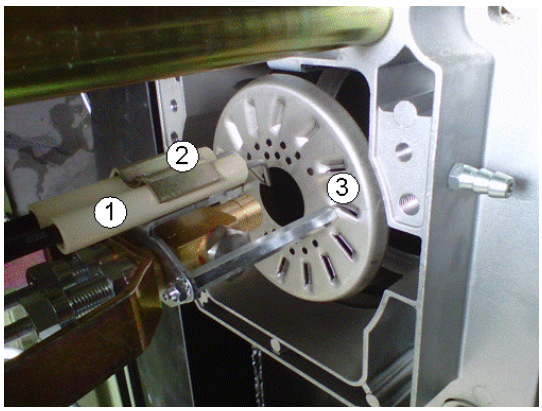
Quarterly Instructions

Primary & Secondary Chamber Burners: (01-002.Q & 02-002.Q)

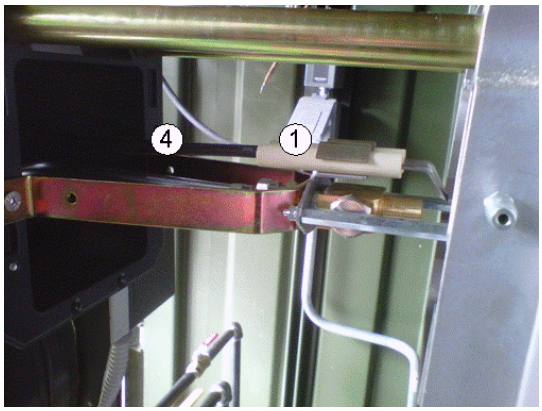
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

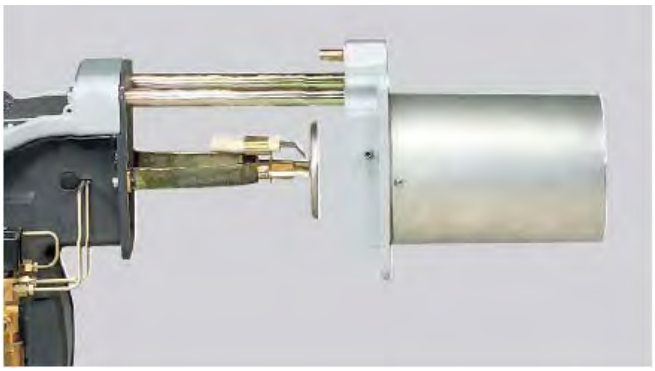
INSTRUCTION 01/02-002.Q.01: INSPECT COMPONENTS FOR HEAT DAMAGE

1. Check all components for heat damage.
2. Look for excessive rust, deformation of all the parts including but not limited to the end cone and the diffuser disc.
3. Check to see that the High Temperature Leads (HT leads) are still intact and have not melted from any excessive heat coming back into the burner. If they are damaged replace with new HT Lead.
    a. The HT leads are attached to the control box and the electrode via a squeeze fitting. Remove the leads from the electrode and control box by simply pulling them out.



1. Electrode
2. U-Bolt
3. Diffuser Disc
4. HT Leads





End cone

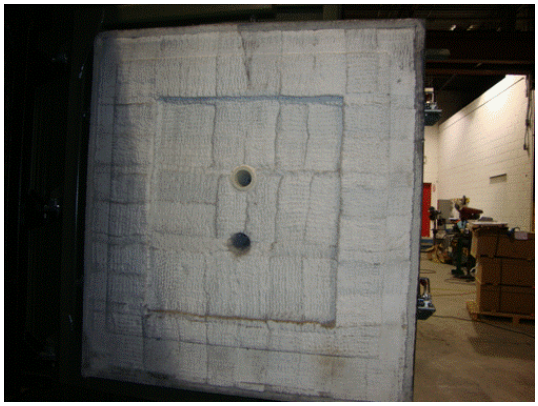
Refractory: (05-001.Q)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

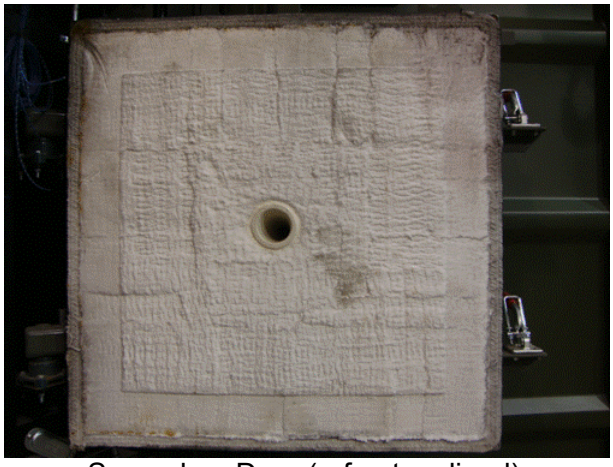
INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

1. Open Primary and Secondary Chamber doors.
2. Fasten doors open, ensuring the door will not close on its own.
3. Inspect door gasket for damage.
4. Replace any damaged segments of door gasket if necessary. Cut out the damaged section and replace with new door gasket. See *Part IV Section 4 CMI 4.4.2/05-001C*.
5. Doors must close tightly and securely, ensuring a good seal.



Primary Door (refractory lined)

1. Primary Door Gasket



Secondary Door (refractory lined)

1. Secondary Door Gasket

INSTRUCTION 05-001.Q.02: INSPECT REFRACTORY FOR SHRINKAGE

1. Ensure power is locked out.
2. Open Primary and Secondary Chamber doors.
3. Fasten doors open, ensuring they will not close on their own.
4. Enter Primary and Secondary Chamber and check the refractory for shrinkage, anything greater than 2.54 cm should be patched.
5. Check to make sure the anchoring of the modules is still strong and intact, if any modules seem loose replace complete module with new module.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor).

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell).

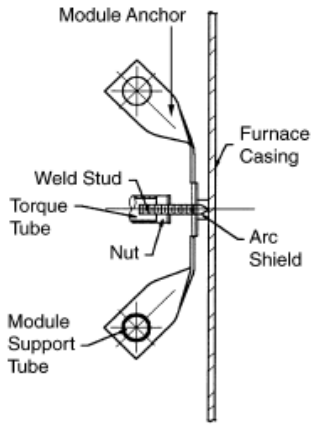


Figure 1: Side view of the Weld Loc Module

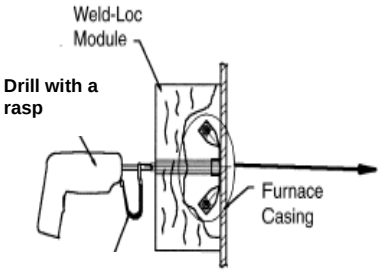


Figure 2: Stud Gun with rasp and Torque Tube.

A. INSTALLATION: Once the new module is in place take the stud gun with rasp to the Torque Tube and drill into place.

B. Once it has tightened the Torque Tube should come off with the drill.

Air Compressor (03-001.Q)

 **INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.**

 **HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Lockout/Tagout machine. Compressor must be connected to properly grounded circuit.**

 **MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.**

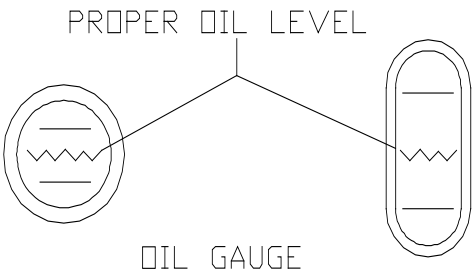
 **HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not Touch hot compressor or tubing.**

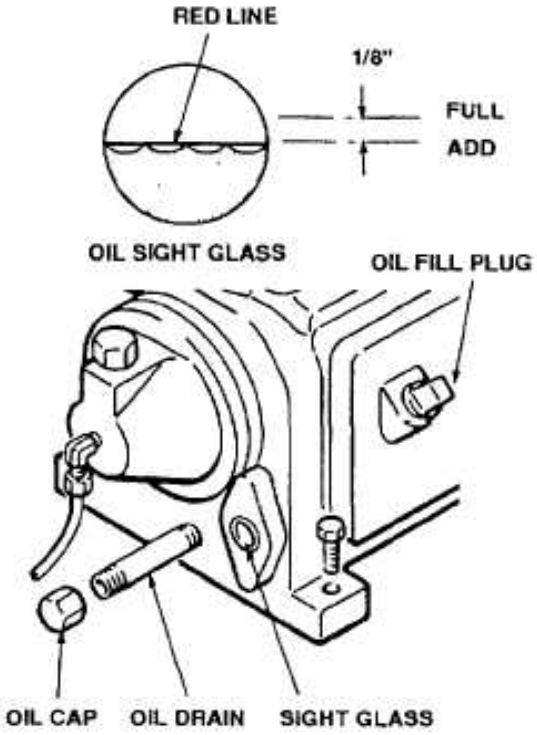
 **HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air-stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.**

 **RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.**

INSTRUCTION 03-001.Q.01: CHANGE THE OIL

1. Change the oil





2. Remove the oil cap (above) to drain the oil.
3. Replace oil cap.
4. Refill the oil reservoir, using compressor oil, to the fill line as illustrated above.
5. Maintain oil level mid-way between the upper and lower lines of the crankcase sight gauge. See illustration above.

Paint: (05-003.Q)

Ensure proper ventilation and proper equipment is being used when using any paint product.

INSTRUCTION 05-003.Q.01: INSPECT AND MAINTAIN EXTERIOR PAINT

1. Maintain paint exterior to protect metal from heat and corrosion damage. This includes all components in the system including containers and incinerator components.

2. If discoloration is noted and painting needs to be performed, on areas where paint will be applied, you must do a light sanding before application.

3. Follow paint manufacturer's application instructions which will include surface preparation, priming and painting.

4. If components within the container need to be painted, for example the Primary Chamber or the Secondary Chamber, proceed as above. Use a type of paint that meets the following specifications:

Paint Specifications:

Incinerator Paint: This is the paint coated directly on the incinerator shell. This includes the following components:

1. Primary Chamber
2. Secondary Chamber
3. Breech Section
4. Hot Stack Section (Black)

Finish needs to be able to withstand temperatures in the 650-750°F (340-400°C) range.

Container Paint: Paint to conform to Customer outlined specifications.

Parts: There are no paint specifications for each individual component. This is left up to the discretion of the customer.

4.2.6 Yearly Instructions

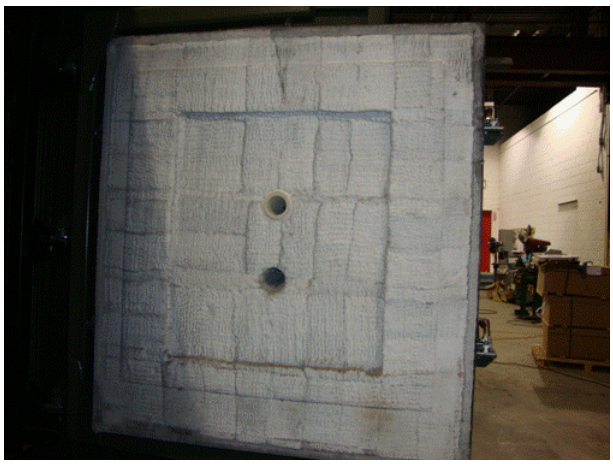
Refractory: (05-001.Y)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

INSTRUCTION 05-001.Y.01:
CHECK DOOR GASKET ALONG PRIMARY & SECONDARY CHAMBER DOORS

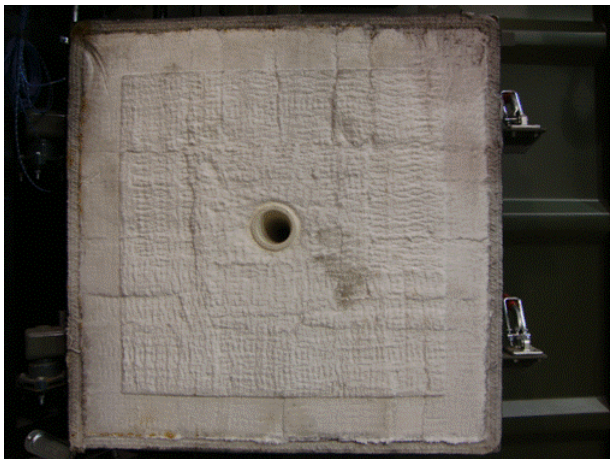
1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

2. Remove the damaged section of door gasket from door and reinstall new gasket



Primary Door (refractory lined)

Primary Door Gasket



Secondary Door (refractory lined)

Secondary Door Gasket

Electrical: (05-004.Y)

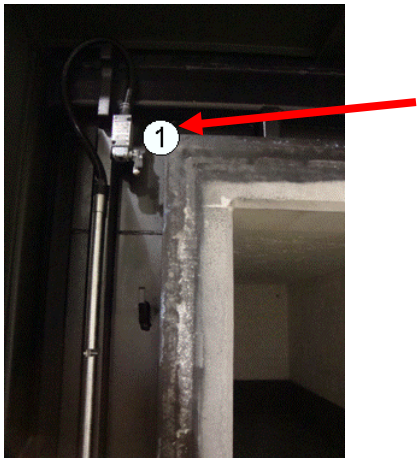
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 4.2.2 Zero Mechanical State & Lock Out Instructions.*

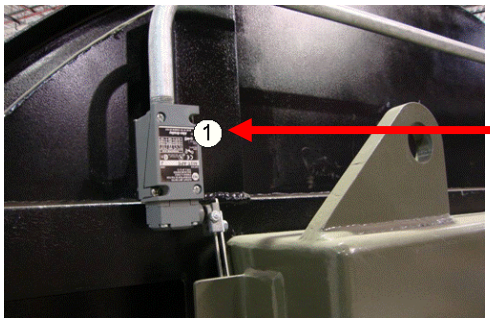
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

NOTA System must not be running or in cool down to perform this inspection.

1. Open Primary and Secondary Chamber doors and check top view screen on the HMI Panel view to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI Panel View to ensure that it indicates door is closed.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches if necessary.



Primary Chamber Limit Switch



Secondary Chamber Limit Switch

5. See *Part IV Section 4 CMI 4.4.1/05-005A*.
6. Check all other limit switches in the system.

4.3 CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

The following instructions relate to the replacement or correction (fixing) of components of the EWS Mobile Incinerator Package.

These Corrective Instructions are grouped in this section by the following:

4.4.1 General Corrective Maintenance Instructions
4.4.2 Refractory Corrective Maintenance Instructions
4.4.3 Primary & Secondary Burner Corrective Maintenance Instructions
4.4.4 Primary & Secondary Blower Corrective Maintenance Instructions
4.4.5 Main Control Panel Corrective Maintenance Instructions

As per the *Preventive Maintenance Instructions Section 4.2* of this *Manual*, the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Burner		**01-002**	
	Replacing Fuel Filter		4.4.1/01-002A
Secondary Burner		**02-002**	
	Replacing Fuel Filter		4.4.1/02-002A
Thermocouple		**05-002**	
	Replacing Thermocouple		4.4.1/05-002A
Limit Switch		**05-005**	
	Limit Switch Replacement		4.4.1/05-005A
Container Door Gasket		**05-006**	
	Replacement of Container Door Gasket		4.4.1/05-006A
Refractory		**05-001**	
	Wall Refractory: Gaps between the Modules		4.4.2/05-001A
	Wall Refractory: Replacement of the Modules		4.4.2/05-001B
	Door Gasket		4.4.2/05-001C
	Castable Refractory		4.4.2/05-001D
	Temporary Repair of Castable		4.4.2/05-001E
Primary Burner		**01-002**	
	HT Lead & Electrode Replacement		4.4.3/01-002A
	Diffuser Disc Replacement		4.4.3/01-002B
	Nozzle Replacement		4.4.3/01-002C
	End Cone Replacement		4.4.3/01-002D
	Nozzle Assembly Repair or Replacement		4.4.3/01-002E
	Burner Flexible Oil Line Replacement		4.4.3/01-002F
	Low Level Switch Replacement		4.4.3/01-002G
	Inspection Window Replacement		4.4.3/01-002H
	Fuel Pump Replacement		4.4.3/01-002I
	Control Box Replacement		4.4.3/01-002J
	Oil Tube Replacement		4.4.3/01-002K
	Burner PE Cell & UV Detector Replacement		4.4.3/01-002L
	Burner Fan Motor Replacement		4.4.3/01-002M
Secondary Burner		**02-002**	
	HT Lead & Electrode Replacement		4.4.3/02-002A

	Diffuser Disc Replacement		4.4.3/02-002B
	Nozzle Replacement		4.4.3/02-002C
	End Cone Replacement		4.4.3/02-002D
	Nozzle Assembly Repair or Replacement		4.4.3/02-002E
	Burner Flexible Oil Line Replacement		4.4.3/02-002F
	Low Level Switch Replacement		4.4.3/02-002G
	Inspection Window Replacement		4.4.3/02-002H
	Fuel Pump Replacement		4.4.3/02-002I
	Control Box Replacement		4.4.3/02-002J
	Oil Tube Replacement		4.4.3/02-002K
	Burner PE Cell & UV Detector Replacement		4.4.3/02-002L
	Burner Fan Motor Replacement		4.4.3/02-002M
Primary Blower		**01-001**	
	Air Proving Switch Replacement		4.4.4/01-001A
	Damper Calibration		4.4.4/01-001B
	Modutrol Resistor Replacement		4.4.4/01-001C
	Damper Crank Arm Replacement		4.4.4/01-001D
	Motor Replacement		4.4.4/01-001E
	Modutrol Motor & Transformer Replacement		4.4.4/01-001F
	Replace the Blower Contactor		4.4.4/01-001G
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		4.4.4/02-001A
	Damper Calibration		4.4.4/02-001B
	Modutrol Resistor Replacement		4.4.4/02-001C
	Damper Crank Arm Replacement		4.4.4/02-001D
	Motor Replacement		4.4.4/02-001E
	Modutrol Motor & Transformer Replacement		4.4.4/01-001F
	Replace the Blower Contactor		4.4.4/01-001G
Main Control Panel		**03-010**	
	Main Control Panel		4.4.6/03-010A
	Reboot PLC		4.4.6/03-010B
	PLC Parts Replacement		4.4.6/03-010C

4.3.1 General Corrective Maintenance Instructions

LIMIT SWITCH REPLACEMENT (4.4.1/05-005A)

1. Loosen the 2 screws holding the limit switch in place.
2. Remove limit switch, replace with a new one.
3. Take arm off of old body and mount to new.
4. Tighten the 2 screws holding the limit switch body.

REPLACING THERMOCOUPLE (4.4.1/05-002A)

The thermocouple will require routine replacement. The environment inside the incinerator will erode the protection tube to the point of failure. If the element is exposed to this environment it will be destroyed and will need to be replaced.

1. Unscrew thermocouple lid and remove wires.
2. Remove protection tube. To aid with this a vise and a pipe wrench will be needed.
3. Remove element and replace with new element and protection tube

4. Reinstall on incinerator.

5. After installation turn power back on. Observe the temperature reading of the thermocouple you were just working on. If the wires were installed incorrectly the temperature will read the opposite temperature. (I.e. 20°C would read as -20°C). If this is the case open the thermocouple housing and switch the wires.

REPLACING FUEL FILTER (4.4.1/01-002A AND 02-002A)

The fuel filter will require routine replacement to ensure clean fuel delivery to the Primary and Secondary Chamber burners.

1. Close the Ball Valve on the supply line.

2. Unscrew the used Red filter. Use a bucket to catch the surplus fuel when you unscrew the filter.

3. Before installing the filter lubricate the seal on the new filter.

4. Install the new filter, and open the supply line ball valve.

4.3.2 Refractory Corrective Maintenance Instructions

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

WALL REFRACTORY: GAPS BETWEEN THE MODULES (4.4.2/05-001A)

The ceramic block refractory will shrink over time exposing the exterior metal shell. These gaps need to be filled in with ceramic refractory blanket.

1. Identify gaps in the chamber that are larger than 1” in width between the modules or if you can see exterior shell.

2. With a Utility knife cut a length of ceramic blanket that will fit in the gap between the modules.

3. Stuff the blanket into the space with a straight edge or ruler.

WALL REFRACTORY: REPLACEMENT OF MODULES (4.4.2/05-001B)

Excessive damage to a section of refractory may necessitate the replacement of modules in the incinerator. Such damage is largely due to mechanical wear. The following diagram walks through the removal and installation of new modules.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor)

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell)

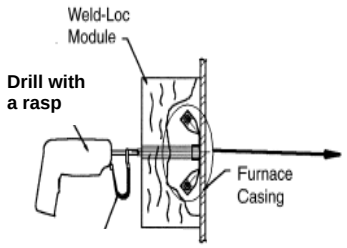


Figure 2: Stud Gun with rasp and Torque Tube (part of module assembly).

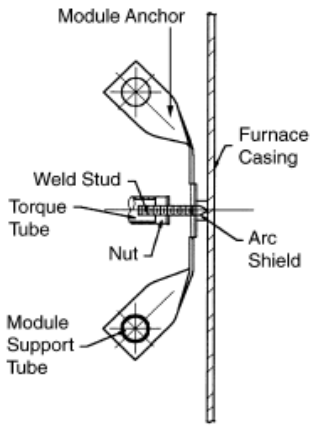


Figure 1: Side view of the Weld Loc Module

C. INSTALLATION: Once the new module is in place take the stud gun (PN: Eco-Stud; EIN: 11-E-S-01-04-016-016) with rasp to the Torque Tube and drill into place.

D. Once it has tightened the Torque Tube should come off with the drill.

DOOR GASKET REFRACTORY (4.4.2/05-001C)

The door gasket will degrade over time and will need to be replaced over time. The bottom of the door will see more degradation due to the waste burning in that vicinity.

1. Identify the damaged section of gasket that will need to be removed
2. With a utility knife cut out the section that needs to be replaced.
3. A new piece of gasket will need to be cut the same length as the removed piece.
4. With contact cement coat the gasket on one side and the door section and install.

CASTABLE REFRACTORY (4.4.2/05-001D)

Operators will notice that the castable refractory will show signs of minor cracking. The minor cracking is normal. Large sections of castable should not separate from the rest of the monolithic cast. Such occurrences are largely due to a sudden impact from machinery or

dropping of the units themselves. Mortar is supplied to help with a temporary repair while a permanent repair is resolved. Such permanent repairs are a third level repair and have to be considered on a case by case basis.

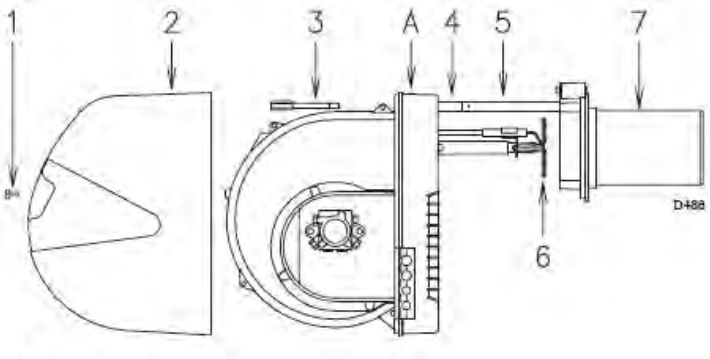
TEMPORARY REPAIR OF CASTABLE (4.4.2/05-001E)

1. Find the pieces of castable refractory that have separated.
2. Clean both the pieces of refractory and the area where the separation occurred.
3. Spread an even amount of high temperature mortar on the pieces and the area of separation.
4. Put the pieces back where they originated and support as necessary for a minimum of an hour while the mortar cures.

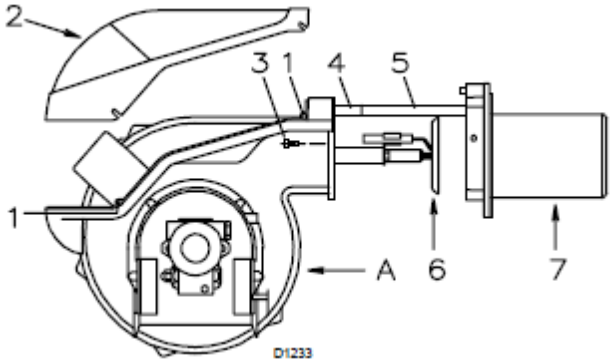
4.3.3 Burner Corrective Maintenance Instructions

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

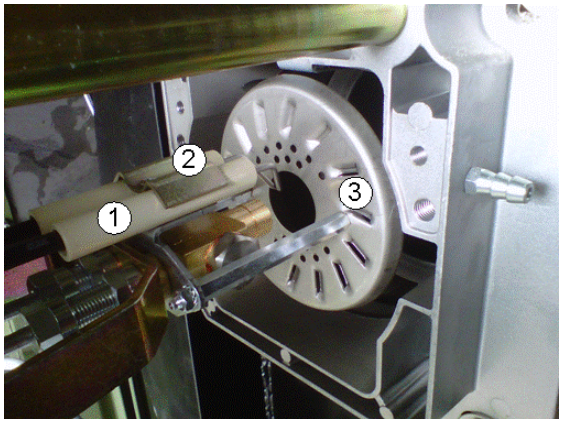
The Burners are pieces of equipment that will require routine corrective and preventive maintenance. Parts within this assembly will need to be repaired or replaced. The most common parts to be repaired or replaced are located at the front end of the burner where the parts are exposed to high temperatures.



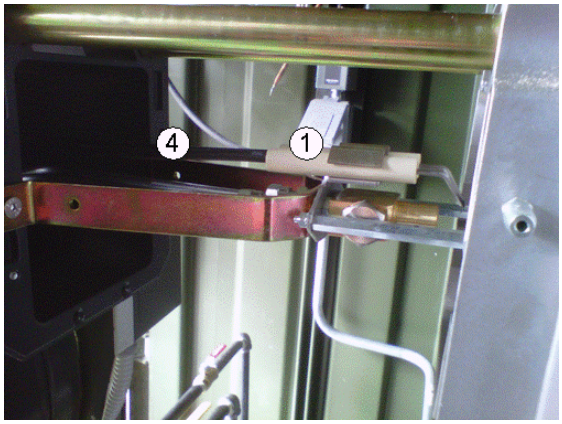
Front End Primary Burner



Front End Secondary Burner



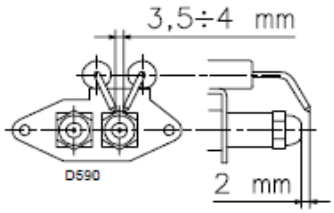
1. Electrode
2. U-bolt
3. Diffuser Disc



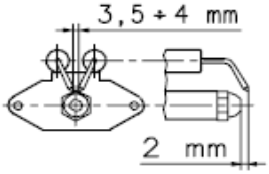
4. HT Leads

HT LEAD & ELECTRODE REPLACEMENT (4.4.3/01-002A & 02-002A)

1. In order to change out the HT leads or Electrode the U-Bolt will have to be removed
2. Remove the electrode by pulling the lead out of the white ceramic tube, replace and re-install.
3. To change the Leads the wire will need to be removed from the burner.
4. Pull the wire out of the burner housing through the rubber grommet.
5. The other end is connected to the back of the control box. Pull the wire straight out and the spring fitting will disengage.
6. Replace the lead with a new one reversing the above directions.
7. When reinstalling the electrodes make sure that they are positioned as shown below:



Primary Burner



Secondary Burner

DIFFUSER DISC REPLACEMENT (4.4.3/01-002B & 02-002B)

1. Locate the diffuser disc in the above pictures.
2. The disc assembly is secured to the nozzle housing by 2 hex nuts.
3. Remove these nuts and remove the assembly from the burner.
4. The disc is attached to the assembly with 2 screws.
5. Remove the screws and replace the disc.
    - Primary Chamber Burner diffuser disc
    - Secondary Chamber Burner diffuser disc
6. Reassemble.

NOZZLE REPLACEMENT (4.4.3/01-002C & 02-002C)

1. Locate the nozzle at the very front end of the burner just behind the diffuser disc.

2. Remove the nozzle with a wrench.

3. Install the new nozzle.
    - Primary Chamber Burner nozzle
    - Secondary Chamber Burner nozzle

END CONE REPLACEMENT (4.4.3/01-002D & 02-002D)

The End Cone is marked Item #7 in the first diagram of Section 4.4.3. The end cone will need replacement when the flame becomes unstable from too much heat damage.

1. Loosen and remove the 4 hex bolts that hold the burner on the flange.

2. Remove the burner completely from the incinerator. This will require more than one operator because the burner is heavy.

3. There are two screws that hold the End Cone on. Remove and save the screws for the new End Cone.

4. Install the new End Cone with the old screws.
    - Primary Chamber burner end cone
    - Secondary Chamber burner end cone

5. Reinstall the burner.

NOZZLE ASSEMBLY REPAIR OR REPLACEMENT (4.4.3/01-002E & 02-002E)

The nozzle assembly is subjected to high heat cycling. The heat cycling will eventually cause the seals and assembly to leak. The assembly will have to be replaced when this occurs. First identify the location of the nozzle assembly.

- Primary Chamber Burner nozzle assembly:
- Secondary Chamber Burner nozzle assembly:

The parts (seals, nozzle assembly) needed for these replacements are all included under one part number.

- Primary Chamber Burner nozzle assembly:
- Secondary Chamber Burner nozzle assembly:

Remove all connections to the nozzle assembly and replace with the above parts.

BURNER FLEXIBLE OIL LINE REPLACEMENT (4.4.3/01-002F & 02-002F)

1. Turn the inline ball valve to the closed position to isolate the fuel supply from the burner. This valve is located down line from the burner.

2. Remove flexible lines.

3. Replace with new lines.

    - Primary Chamber Burner flexible oil line:
    - Secondary Chamber Burner flexible oil line

4. Open ball valve.

Primary Chamber Burner Flexible lines
(1 Above)

Secondary Chamber Burner Flexible Lines
(1 Above)

LEVEL SWITCH REPLACEMENT (4.4.3/01-002G & 02-002G)

The level switch is located in the Diesel Tank.

NOTA

Tanks do not have to be emptied to replace.

1. Unplug the level switch from tank.

2. Disconnect the cord and remove the level switch.

3. Replace level switch and reconnect the cord.

4. Plug in the level switch to tank.

INSPECTION WINDOW REPLACEMENT (4.4.3/01-002H & 02-002H)

The inspection window can be identified as Item # 7 on IPD-I03 for the Primary Burner and Item # 32 on IPD-I04 for the Secondary Burner. To replace the window simply remove the old inspection window and replace with a new one:

- Primary Burner inspection window
- Secondary Burner inspection window

FUEL PUMP REPLACEMENT (4.4.3/01-002I & 02-002I)

Identify the pump on the burner you wish to replace the pump on:

- Primary Burner:
- Secondary Burner :

Remove all fuel connections to the pump with the appropriate wrench. Unbolt the pump from the main body of the burner and pull the pump away from the burner to remove.

Reinstall the new pump, and reattach all fuel connections.

- Primary Burner:
- Secondary Burner :

CONTROL BOX REPLACEMENT (4.4.3/01-002J & 02-002J)

Identify the control box on the burner you wish to replace the control box on:

- Primary Burner:
- Secondary Burner :

Ensure the power is off, unscrew the old control box, and install the new one.

- Primary Burner:
- Secondary Burner :

OIL TUBE REPLACEMENT (4.4.3/01-002K & 02-002K)

Oil tubes leak due to heat cycling which causes the fittings to fail or a loose fitting.

1. Identify the oil tubes on the Primary Burner and Secondary burner

2. First try tightening the fittings to see if the leak stops. If the leak does not stop:

3. Remove the old oil tubes with a wrench and install the new ones:

    - Primary Burner Tubes:
    - Secondary Burner Tubes

BURNER PE CELL & UV DETECTOR REPLACEMENT (4.4.3/01-002L & 02-002L)

Primary Burner: If the PE cell has been damaged, then it will need to be replaced. The PE cell while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new PE cell install the control box end first by pushing the connection hard. Reinstall the PE cell in the burner.

Secondary Burner: If the UV Detector has been damaged, then it will need to be replaced. The UV Detector while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new UV Detector install the control box end first by pushing the connection hard. Reinstall the UV Detector in the burner.

BURNER FAN MOTOR REPLACEMET (4.4.3/01-002M & 02-002M)

Identify the malfunctioning motor in the affected burner:

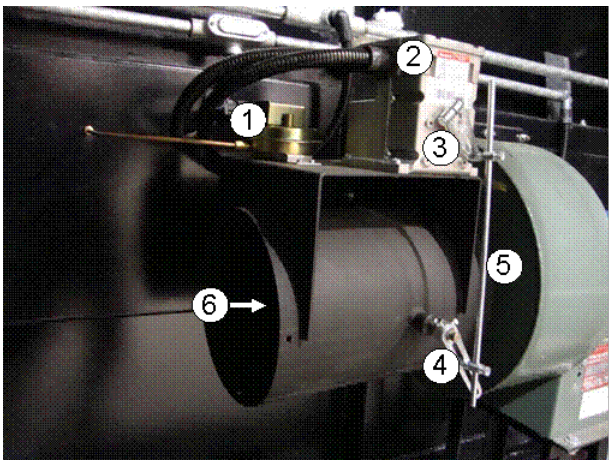
- Primary Burner –
- Secondary Burner -

Unbolt and remove the malfunctioning motor from the housing the burner. Disconnect all electrical connections. Reinstall the new motor exactly how the old motor was installed.

4.3.4 Primary & Secondary Blower Corrective Maintenance Instructions

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

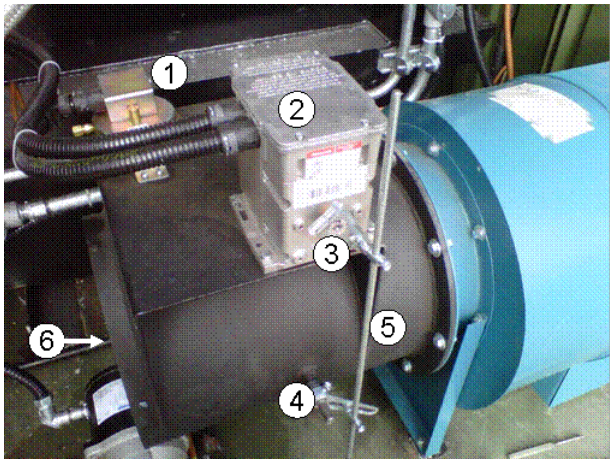
Primary Blower Assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Primary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

Secondary Blower Assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Secondary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

AIR PROVING SWITCH REPLACEMENT (4.4.4/01-001A & 02-001A)

1. Ensure all power is locked out.
2. Remove wiring from switch.
3. Remove tubing from switch.
4. Unscrew screws at the two locations and remove switch.
5. Reinstall new switch complete with tubing and wiring and then retighten.
6. Turn power back on.

DAMPER CALIBRATION (4.4.4/01-001B & 02-001B)

Sometimes the damper linkage will slip when the connections become loose (Items 3,4,5 in the Secondary Blower photo) In order to ensure that the linkage is correctly calibrated the operator will need to look at the display screen on the control panel while the unit is in operation

1. Read the %Open value on the control panel operator interface (PanelView) for the Primary Blower.
2. During operation the damper is factory preset to be 0% open, or fully closed.
3. Look inside the damper (Item 6) and ensure that the linkage is completely closed.
4. If it is then this maintenance is complete.
5. Should the damper be open even a small percentage the linkages are to be loosened and the damper adjusted to be completely closed, and then retighten.

MODUTROL RESISTOR REPLACEMENT (4.4.4/01-001C & 02-001C)

The Modutrol resistors are located inside the top lid of the Modutrol motor. Remove the lid to the Modutrol motor by unscrewing the top four (4) screws. The connection between the control panel and the Modutrol is made with a small white connector with 3 terminals. Jumpered between these terminals is the resistors.

Remove and replace the resistors one at a time to ensure the correct resistors are replaced. You identify the correct resistor by examining the color band on the center node of the resistor. Replace like resistors.

DAMPER CRANK ARM REPLACEMENT (4.4.4/01-001D & 02-001D)

The crank arm will only need to be replaced if the arm is damaged due to misuse. Identify the damper crank arm (Item #4 in the picture on the previous page).

Identify the location of the linkage on the rod and the damper arm with a marker, so the new crank arm will be in the same spot when reinstalled. Remove the connections to the crank arm and replace with the new one and ensure it is in the same spot as the old one.

MOTOR REPLACEMENT (4.4.4/01-001E & 02-001E)

Replacing the motor requires a second level maintenance. This information can be found in the OEM manual New York Blower, Installation, Maintenance and Operating, IM-160 Junior Fans.

MODUTROL MOTOR & TRANSFORMER REPLACEMENT (4.4.4/01-001F & 02-001F)

To replace a Modutrol motor requires all power to be off to the system as you will need to expose electrical connections. Firstly get the new motor and orientate the motor in the same direction as the old motor. Identify where the conduit is connected on the old motor and punch the connector holes for the new motor.

Removal

1. Remove and electrical terminations and remove the transformer.
2. Install the transformer in the new Modutrol motor.
3. Remove all conduit connections on the motor.
4. Remove the damper arm and linkage from the motor.
5. Unbolt the motor from the damper, and ensure all nuts and bolts are kept for the new motor install

Install

1. Bolt the new motor in the same orientation as the old motor.
2. Install the damper arm and linkage to the motor
3. Install all conduit connections

Terminate all electrical connections the same as the old motor.

REPLACE THE BLOWER CONTACTOR 4.4.4/01-001G

1. Turn off Main Disconnect.
2. Open Panel.
3. Remove the wires from blower contactor.
4. Pull the retaining clip up.
5. Tilt contactor forward and remove.
6. To reinstall tilt new contactor until it clicks back in.
7. Pull the retaining clip back down to lock.
8. Reinstall wires to contactor.
9. Close panel.
10. Turn power back on.

4.3.5 Main Control Panel Corrective Maintenance Instructions

MAIN CONTROL PANEL (4.4.6/03-010A)

All control panel diagnostics are to be completed by certified or trained technicians. Electrical drawings / diagrams are provided to aid electricians with any diagnostics. For reference the parts diagrams for the main control panels are drawings

REBOOT PLC (4.4.6/03-010B)

Turn Main Disconnect to the off position on the front of the Control Panel. Turn the main disconnect back on.

PLC PARTS REPLACEMENT (4.4.6/03-010C)

For detailed repair procedures, refer to the OEM Manual, Part IV Control Panel, PLC.

Read all warnings for procedures in each OEM Manual as they contain critical safety information. Disconnect the power from each component before starting each corrective maintenance procedure.

Component	Procedure	OEM Manual	Page No.
Panelview 1000-Series	Replacing the Battery	Panelview (2711P-T10C4A8)	130
Panelview 1000-Series	Replacing the Backlight	Panelview (2711P-T10C4A8)	126

Panelview 1000-Series	Load and SD card	Panelview (2711P-T10C4A8)	135
Panelview 1000-Series	Removing the Product ID Label	Panelview (2711P-T10C4A8)	134
Panelview 1000-Series	Replacing the Bezel	Panelview (2711P-T10C4A8)	124
Panelview 1000-Series	Cleaning the Display Window	Panelview (2711P-T10C4A8)	136
16 Point Relay Output Module	Replacing a Single Module	I/O Modules Compact 16-PointRelay Output Module (1756-OA16)	156
8 Channel Analog Output Module	Replacing a Single Module	Analog I/O modules Compact 1756-OF4 Analog Output Module	187
8 Channel Analog Input Card	Replacing a Single Module	Analog I/O Modules Compact 1756-IF8 Input Card	187
6 Channel Thermocouple Input Module	Replacing a Single Module	Analog I/O Compact 1756-IT6I Thermocouple Input Module	187

4.3.6 Additional Maintenance Instructions

For more detailed and additional maintenance instructions please refer to the OEM manuals for the Incinerator components.

Baffinland Iron Mines Corporation

Incinerator Operation Procedure

BAF-PH1-320-PRO-0002

Rev 0

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03/10/14	0	TM	BP	Use

TABLE OF CONTENTS

1 PURPOSE AND SCOPE

Baffinland Iron Mines Corporation is committed to taking the necessary steps to ensure that the collection, handling, storage, transportation and disposal of wastes generated during the construction, operation and closure of the Mary River Project is conducted in a safe, efficient and environmentally compliant manner.

The purpose of this procedure is to provide a set of operational requirements for the safe incineration of waste in an environmentally-acceptable manner at the Mary River Project. The incineration of waste is one of a number of elements of the Mary River Project source segregation and waste management program.

2 REQUIREMENTS

2.1 HAZARDS AND ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT (PPE)

2.1.1 HAZARDS

There are numerous specific hazards associated with the management of the incinerator. They include:

- Explosive Gases (aerosol cans/ batteries)
- High temperature
- Sharp objects (i.e. barrel lids, broken glass)
- Flying dust and small particles
- Potential fuel spills
- Encounter with wildlife (wildlife attractants)
- Electricity

2.1.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Wear Standard P.P.E. - Safety glasses, hard hat with reflective tape, safety boots, reflective vest, clothing in good condition, gloves or mitts in good condition and hearing protection if required
- Full face dust mask (such as Advantage 3000 Respirator)

2.1.3 SAFETY AND ENVIRONMENTAL EQUIPMENT

- 20lb Fire Extinguisher
- Sea cans for storage of wastes to be burnt
- Overpack drums for storage of ash
- Spill kits
- Radio Communication

2.2 Training and/ or Qualifications

Any persons who may be operating the incinerators at a Baffinland work site shall complete formal, documented training in its proper use.

2.3 General Safety Instructions

- Keep the electrical panel doors closed at all times except when performing electrical maintenance or troubleshooting.
- Allow only qualified operators to perform maintenance and troubleshooting on the machine.
- Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.
- Do not bypass or tie down any of the door safety limit switches.
- Do not open any of the doors while the Primary or Secondary Chambers are above 200°F (93 °C).
- Do not enter the Primary Chamber unless the Emergency Stop Button is pushed.
- When opening or closing the Primary Chamber door keep clear of the door and ensure that the path for the door is clear.
- Secure the Primary Chamber door when it is open so it cannot move accidentally.
- Immediately correct any fuel leaks.
- Do not fill the Primary Chamber above the breech opening. Overfilling can result in poor burning and damage to the Incinerator.
- Be aware of component-specific safety hazards listed within each section of this manual.

3 DEFINITIONS

Refractory: Insulating ceramic liner inside the primary and secondary chambers that is able to withstand high temperatures without fusion or decomposition.

Purge Cycle: First step of the burn cycle which exhausts potentially explosive gases that could be remaining in the system and burners. The primary and secondary blowers will run to purge both chambers. The primary and secondary blower indicators on the Top View screen on the Operator Interface will say “Primary Chamber Blower On” and “Secondary Blower On”.

MSC: Mine Site Complex

PSC: Port Site Complex

4 RESPONSIBILITIES

The following roles have specific accountabilities that must be met to ensure the Mine Site Complex (MSC) and Port Site Complex (PSC) incinerators are operated in compliance with this procedure and its permit. The following roles and responsibilities shall be followed to safely and successfully operate the incinerator.

Site Services Superintendents/Supervisors are responsible for ensuring that all personnel are fully trained and competent to meet the expectations of this policy.

4.1 MSC/PSC Site Services Supervisor

The Site Services Supervisor is responsible for supervising the operation of the incinerator in accordance with this procedure. Specifically, the Site Services Supervisor shall:

- Supervise the incinerator operator in the safe execution of this procedure.
- Implementing this procedure and ensuring that Incinerator Operators are qualified and knowledgeable in the operation of the Incinerator.
- Providing Personal Protective Equipment required for the safe operation of the incinerator and the protection of workers.

4.2 Incinerator Operator

The Incinerator operator, under the general supervision of the Site Services Supervisor, is responsible for executing the following tasks at the incinerator:

- Understanding and following this Procedure, including:
    - Ensuring that no inappropriate materials are processed and that each batch contains an average mix of waste that resembles the design waste characteristics (particularly volume/weight per batch, average density, and overall heat value).
    - Understanding the commitments made by Baffinland Iron Mines to regulatory bodies, with regards to emission targets, monitoring and recording requirements.
    - Ensuring the burn cycle is long enough to allow for thorough burn-out and the generation of high-quality ash residual that is safe for disposal.
    - Minimize particulate matter (dust) emissions during ash removal and handling.
- Wearing the proper P.P.E. when operating the incinerator.

4.3 Environment Department

The Environment Department is responsible for executing the following tasks:

- Overseeing Incinerator Operations to ensure that practices are in compliance with the guidelines as set out in Baffinland's Waste Management Plan.
- Collect monthly incinerator data from the PLC.

5 PROTOCOL

5.1 WASTE LOAD DESIGN

The types of waste that can be processed in the incinerator are described in table 1. Waste materials not suitable for processing are described in table 2. When preparing a waste load, the operator shall follow these requirements:

- System capacity is 2,000 kg/day.
- Table 1 describes a typical one metric ton load. Respect proportions as much as possible.
- Prepare the load in layers: Start with cardboard or wood at the bottom, then kitchen waste, then more cardboard, etc.
- Waste shall be loose, as received and not compacted prior to loading.
- When receiving large volume of PET bottles (clear plastic), some compaction is recommended.
- The system shall not be overloaded with plastics or wood, or any other high heat value materials.
- Materials containing large air spaces (empty plastic bottles, cardboard boxes) shall be flattened before loading.
- When processing batches of very wet materials (more than 60% food waste), the burn cycle time should be increased to accommodate the additional time required to dry the waste before it can combust.
- Do not load the system with more than 25% by volume of extremely wet materials such as wet garbage.
- Unauthorized waste materials shall never be processed in the system

Table 1. Waste Materials suitable for incineration

Waste Type	Description	Origin	Proportion
Food Waste	Food, food packaging and containers, plastic and paper waste from food preparation	Kitchen and dining areas, office areas	55% or 550 kg/ton load
Domestic waste	General refuse such as paper, plastics, cans, bottles, cardboard, newsprint	Dormitory areas, recreation facilities, office areas, warehouse, plant and production facilities	30% or 300 kg/ton load
Packaging	Cardboard boxes, paper, plastic	Inbound supplies to all work	10% or 100 kg/ton load

	containers, plastic film, Styrofoam, poly-weave bags	areas	
Wood waste	Skids, pallets crates	Construction activity, inbound supplies	
Absorbents	Rags, wipes, spill cleanup materials	From all work areas	5% or 50 kg/load
Filters – Air and Fluid	Filters coated with fine particles and trapped solids, saturated with water or fluids (glycol, lube, oils, fuel)	From water treatment facility, or generated at point of maintenance of vehicles, machinery and equipment	
Biomedical waste	Bandages, dressings, gloves, swabs, syringes, sharps	Medical clinic	

Table 2. Unacceptable Waste Materials

Solid Waste	Examples
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils
Radioactive Materials	Smoke detectors, laboratory wastes
Potentially Explosive Materials	Pressurized vessels including, but not limited to propane tanks, aerosol cans (deodorant, shaving, cleaning, etc) and the like. Actual explosives.
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels, batteries
Solvents	Solvents such as acetone, xylene, methanol

5.2 Operating Instructions

The operation of the incinerator package follows 4 general steps that take place over a 24 hour period:

5.2.1 General Inspection of the System

- Ensure that manual slide gates for each blower are in the open position for free airflow into the Primary and Secondary Chambers
- Ensure the Primary Chamber has been cleaned out, and the chamber floor is cool (less than 40 ^{o}C). If the floor is hotter than this temperature the waste may spontaneously catch on fire during loading
- Ensure that the fuel tank is full (valves, levels)
- Perform a visual inspection of the primary and secondary chambers
- If the reset light is illuminated on the primary or secondary burners, call the Maintenance department

5.2.2 Load Waste into Primary Chamber and Close Doors

- When loading the waste, avoid contact with refractory (wall modules, door jams, sills, lintel, etc.). Doing so will damage the ceramic blanket refractory
- Ensure that the waste is loaded according to the Waste Load Design
- Ensure that the waste is not blocking the burner cone and the breach between primary and secondary burners.
- Close the door

5.2.3 Start Burn Cycle from Control Panel

- Ensure that there are no faults on the panel.
- Ensure the burn time is adequate. The burn time for a one ton load respecting table 1 proportions should be of 720 minutes.
- Ensure that "Solid Waste Only" is selected on the top view.
- At the control panel, on the Panel View press the "Start System" button. The system will initiate the Purge Cycle, followed by the Burn Cycle and then ending with the Cool down Cycle.
    - Observe Systems Purge.
    - Observe Start 120 sec.
    - Observe Burners Purging.
    - Observe Primary blower + burner + secondary blower will shutdown
    - Observe Firing of Secondary Burner
    - Observe secondary chamber reach 1015 ^{o}C (within approximately one hour)
    - Observe primary burner starts + secondary blower
- Periodically check unit

5.2.4 Clean out ash and Dispose

- Once fully cooled and the temperature is below 90 ^{o}C, proceed to the Primary Chamber Clean Out procedure.
- Unlock all door latches on the access door to the Primary Chamber.
- While standing in front of the Primary Chamber door, slowly open the door to its fully open position. Secure Primary Door in the open position.
- Proceed around to the back and open up secondary chamber doors. This will help the cool down process by air flow.
- Inspect the interior for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
- Inspect colour of the ash:
    - If whitish-grey, burn cycle was complete.
    - If ash appears wet and dark, it should be reintroduced in the waste load of the following burn cycle.
- Remove ash and dispose in Overpack drum labelled MS-ASH-# or MP-ASH-# (MSC and MPC, respectively).

- Collect 1 liter of ash from Overpack with metal sampler jar and put in 20 L pail.
- Once the drum is full, switch to a new drum & pail and notify Environment Department.
- The Environment Dept. will take a sample of the 20L pail for analysis, and the pail can then be reused for the next drum.
- Fill out incineration ash log.
- Check the air inlet holes and remove any obstructions if necessary.
- Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb
- Close the Primary Chamber access door by clamping each latch until it is tight
- Clean the inspection view port (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

5.3 Daily Preventive Maintenance

- Allow only qualified operators to perform maintenance and troubleshooting on the machine as per Eco Waste Solutions Incinerator Equipment Manual.

6 REFERENCES AND RECORDS

Nunavut Mine Health and Safety Act and Regulations

Canadian Standards Association

Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and Closure, dated April 19, 2013

Nunavut Water Board Type A Water Licence No: 2AM-MRY1325

Commercial Lease No.: Q13C301

Appendix D -
Landfill Maintenance and Operation Manual

(Document #: BAF-PH1-320-T07-0004)

Baffinland Iron Mines Corporation

Landfill Maintenance and Operation Manual

BAF-PH1-320-T07-0004

Rev 0

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1 PURPOSE AND SCOPE

The purpose of this procedure is to ensure that non-hazardous solid wastes are disposed of in compliance with all environmental permits, licences, and authorizations, and in an efficient and safe manner.

This procedure applies to the handling, storage and disposal of all non-hazardous solid industrial waste at the Mine Site Landfill.

This procedure does not apply to hazardous and liquid industrial wastes, hauled sewage or domestic waste. Refer to Baffinland's Waste Sorting Guidelines (BAF-PH1-830-P25-0001) which clearly differentiates landfill waste from non-hazardous putrescible wastes and hazardous wastes.

This manual has been designed to be used both as a field reference document as well as a training manual for classroom and self-instruction purposes. Every employee with accountabilities and responsibilities as required by this procedure is expected to be familiar with its use at the site. This manual contains the basic knowledge regarding personnel responsibilities, safety practices, and the overall operations of the landfill. Appendix C focuses on Landfill Work Instructions and has been formatted to provide supervisors and their employees with a user-friendly method for training and implementation.

2 REQUIREMENTS

2.1 HAZARDS AND ADDITIONAL PPE (PERSONAL PROTECTIVE EQUIPMENT)

2.1.1 HAZARDS

There are numerous hazards associated with the operation and maintenance of the landfill. They include:

- Mobile equipment dangers and spills
- Flying objects (i.e. debris, broken glass)
- Dust and small particles

2.1.2 PPE

- Wear Standard PPE - Safety glasses, hard hat, safety boots and reflective vest.[1]

2.1.3 SAFETY AND ENVIRONMENTAL EQUIPMENT

- Spill kits
- Radio Communication

2.2 TRAINING/ QUALIFICATIONS AND CERTIFICATIONS

[1] PPE is not required for operators inside enclosed cabs of heavy equipment.

Any operator who may be working at the landfill shall complete the documented training in this procedure and demonstrate their understanding of their responsibilities, and of the hazards and controls. Verification of training will be kept by the Training Department.

3 RESPONSIBILITES

The following roles have specific accountabilities that must be met to ensure the Mine Site landfill is operated in compliance with this procedure. The following roles and responsibilities of the various employees who work at the Landfill site are described below.

3.1 SITE SERVICES MANAGER/SUPERINTENDENT

a. The Site Services Manager, or the Site Services Superintendent during the Manager's absence, is accountable for the overall operation of the landfill. Specifically, he/she shall:
b. Organize, oversee and administer the operation of the landfill in accordance with regulatory requirements and applicable procedures.
c. Plan and coordinate the most efficient use of landfill areas to conserve landfill space.
d. Help develop, implement and enforce landfill specific safety regulations.
e. Meet routinely with the Site Services Supervisors to maintain proper control of the site and to determine what, if any, problems exist or may be anticipated. Consider the following:
    i. Operational issues;
    ii. Regulatory Requirements;
    iii. Equipment issues;
    iv. Special operating instructions – e.g. inclement weather, special waste, emergencies.
f. Schedule routine work as required – e.g. drainage channel cleaning, landfill surface repairs and litter control, etc.
g. Ensure that the need for any special operating conditions have been planned for in advance – e.g. identification of features with stakes in advance of winter and the ground freezing.
h. Coordinate a biannual summer earthworks inspection which shall be conducted by a geotechnical engineer.
i. Schedule the quarterly survey requirements for volume calculations.

3.2 SITE SERVICES SUPERVISOR (MINE SITE)

The Site Services Supervisor, under the general supervision of the Site Services Manager/Superintendent, is responsible for supervising waste disposal and associated activities at the Mine Site Landfill in accordance with this procedure. Specifically, the Site Services Supervisor shall:

a. Regularly brief the Site Services Manager/Superintendent on the status of routine operations and any special problems.
b. Implement and enforce the landfill safety regulations and operating procedures.

c. Check grades and contours to ensure that refuse placement and compaction conforms to engineered specifications and designs.
d. Maintain thorough, accurate and detailed records of landfill operations, and other related matters.Respond to incidents and inquiries promptly to ensure the landfill is operated in compliance with this procedure.
e. Instruct all crews on critical landfill procedures and areas of concern and monitor progress.

3.3 Mine Site Landfill Operator/ Labourer

The Landfill Operator/Labourer, under the general supervision of Site Services Supervisor, is responsible for executing the following tasks at the landfill. Specifically the Operator/Labourer shall:

a. Be trained and experienced in operating the mobile heavy equipment necessary for the work.
b. Work in conjunction with the Site Services Supervisor in executing general landfill operations according to this procedure.
c. Maintain a level landfill base at the working face dumping area,
d. Ensure the landfill is maintained free of windblown litter and that litter fences are appropriately placed and in good condition
e. Employees are to report all violations of site user rules (Appendix B) to their supervisors for further action and incident reporting.

3.4 Environment Department Personnel

The Environment Department will conduct weekly inspections of the Mine Site Landfill. In addition to conducting weekly inspections, Environment personnel shall:

a. Support Site Services by providing guidance on what types of solid wastes are permitted at the Mine Site Landfill.
b. Notify the Site Services Superintendent and/or Supervisor when non-compliance conditions are observed so that corrective action will be taken on a timely basis.
c. Ensure that all contractors and Baffinland employees are familiar with Baffinland's waste sorting guidelines.

4 DEFINITIONS

Waste Management System: A waste management system includes all facilities, equipment and operations for the collection, handling, transportation, storage, processing and disposal of waste.

Landfill Site: Controlled site where no hazardous wastes are accepted and only specific wastes as outlined in the Mine Site Landfill approval permit are accepted. At landfill sites, the waste is regularly compacted and covered.

Mine Site Landfill: For the purpose of this document, the Mine Site Landfill has been constructed as a Non-Hazardous Solid Waste Landfill facility.

Non-Hazardous Solid Waste: The wastes generated during the lifespan of the Project that do not present a threat to human health or the environment.

Hazardous Waste: Material that, given its quantity, concentration and composition or its corrosive, inflammable, reactive, toxic, infectious or radioactive characteristics, presents a real or potential danger to human health, safety and public well-being or poses a danger to the environment if it is not stored, treated, transported, eliminated, used or otherwise managed. Hazardous Waste are not permitted to be disposed of in the Landfill.

Domestic Waste: Domestic waste includes waste such as office paper, lunchroom supplies, washroom supplies, food waste and containers contaminated with food. Domestic waste can be considered all bagged and boxed waste originating from offices, kitchens and camps, generally suitable for disposal in the incinerator. Domestic waste are not permitted to be disposed of in the Landfill as these wastes may be an attractant to wildlife.

Empty Container: Clean, empty containers that did not previously contain hazardous material, food or compressed gas.

5 LANDFILL OPERATIONS

The Mine Site non-hazardous solid waste landfill's operation and maintenance are based on the Guidelines for the Planning, Design and Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (the Guidelines) to ensure both the protection of the environment and the health and safety of individuals. The estimated remaining capacity of the current landfill design is approximately 5,000 m3 of waste and cover material. If additional capacity is required in the future an extension to the current design will be designed and developed.

5.1 CLASSIFICATION OF WASTE

5.1.1 ACCEPTABLE WASTES AT THE LANDFILL

Non-hazardous solid wastes acceptable for disposal at the Mine Site Landfill include the following products:

- Treated wood products[2] – e.g. plywood, painted wood, etc.
- Clean plastics
- Cardboard
- Bulky waste such as heavy equipment, trucks, snowmobiles and appliances. These items will be drained of all fluids (oil, fuel, hydraulic fuel; ozone depleting substances must be removed by a licensed technician) prior to disposal.

[2] Clean untreated wood that can't be reused should be diverted to the designated Burn Area. Please refer to BAF-PH1-300-PRO-0001 Open Burning of Untreated Wood, Cardboard and Paper Products Procedure for clean untreated wood management.

- Concrete
- Glass
- Metal
- Non-toxic incinerator ash
- Empty containers (as defined in this procedure)

5.1.2 Hazardous Material and Other Unacceptable Wastes at the Landfill

Hazardous waste, liquid waste and food waste are NOT accepted at the Mine Site Landfill. They include the following:

- Liquid wastes – e.g. sewage, grey water
- Food waste and other domestic wastes
- Radio-nuclides (Radioactive waste)
- Batteries
- Infectious or medical waste
- Electronic waste – e.g. TVs, computer CRTs (screens) and computer hard drives
- All material regulated by the Transportation of Dangerous Goods Act
- All material requiring a Material Safety Data Sheet (MSDS)
- Chemicals – e.g. paint, solvents, acids, cleaning products, insecticides, etc.
- Any petroleum product – e.g. gasoline, diesel, jet A, waste oil, etc.
- Propane tanks
- All pressurized gas cylinders and aerosol cans
- Fuel drums (205 liter barrels) or other materials/containers previously containing fuel or other hydrocarbons
- Friable asbestos
- All heavy metals such as Beryllium, Cadmium, Mercury, etc.
- Scrap tires

The above list is not all inclusive. For unusual or hard to segregate waste types – e.g. multi-material waste, please contact the Environmental Department.

5.2 Landfill Waste Cell Construction

Due to the presence of permafrost, the area method will be used to place waste in the landfill. Waste will be deposited on the ground, worked with appropriate heavy equipment, and packed against a constructed berm. Construction of the berm will be advanced with the advancing face of the landfill. The waste cell is the basic building block of the landfill. It is composed of several layers of solid waste compacted on a slope by heavy equipment and enclosed on all sides by soil. The general placement of waste will progress down-slope from the southeast rear berm wall towards the northwest end of the site. Basic instructions for constructing waste cells with acceptable materials at the Mine Site Landfill are described below in Figure 1.

5.2.1 Control of Working Face

The working face is the portion of the uncompleted cell on which additional waste is spread and compacted. The optimal working face width varies depending on the number of vehicles bringing wastes to the site and the equipment available for spreading and compacting. It should be wide enough to prevent a backlog of trucks; however, the width should not be so wide as to be impractical to operate or to expose an undue amount of refuse to the wind. The face width should be reduced by compacting and covering portions of the face as soon as a section of the cell meets the grade design. Ideally, for control of the waste exposure to wind, the width of the face should not exceed 12 m at any time.

5.2.2 Equipment Movement

Solid waste should be dumped at the toe of the working face by the collection trucks and pushed up the slope. For safety reasons, keep a minimum of 3 m separation between vehicles. The unloading area is to be maintained level and clear of waste materials.

5.2.3 Spreading Waste on a Slope

To maximize compaction, and to provide an optimal weight distribution of the dozer, the waste should be spread up an approximate 3:1 slope in 0.3 – 0.6 m layers. Fill in any holes that develop in the face with loose waste.

5.2.4 Using Grade Stakes

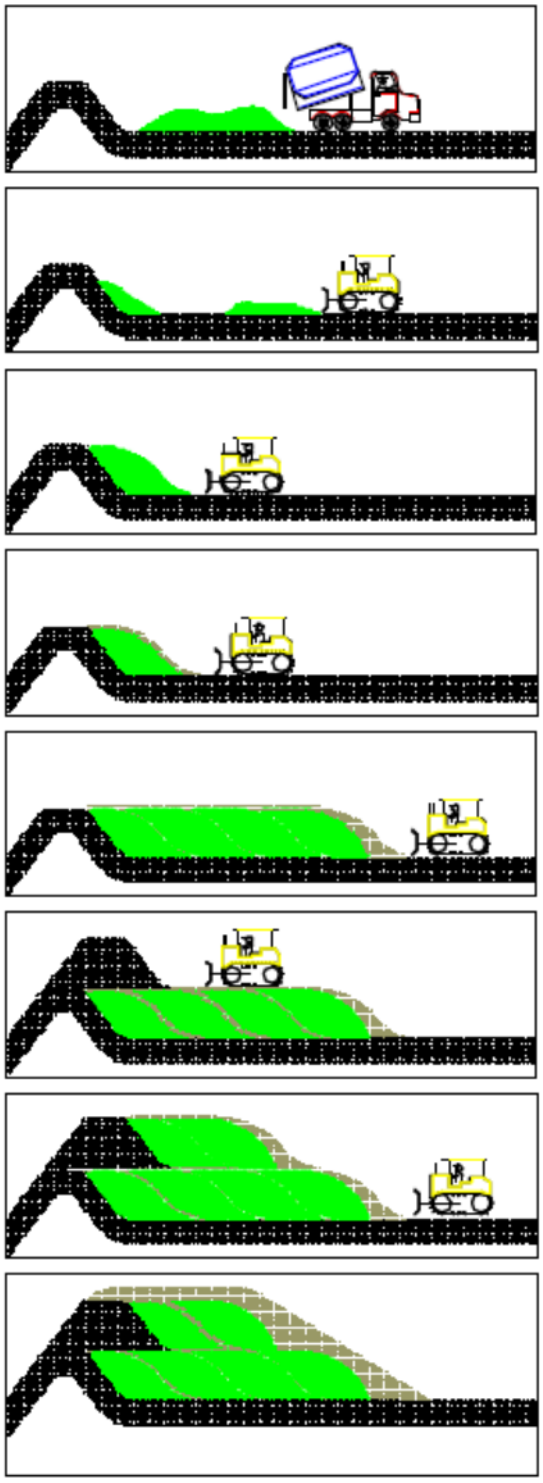
If necessary, use grade stakes to aid operators in keeping the slope of the final top fill surface at a grade of 0.5%, the slope of the cell face 3:1 and the grade of the landfill base to 0.5%, approximately.

5.2.5 Waste Compaction

A high degree of compaction extends the fill life, reduces cover material and long-term land requirements, reduces litter problems, and results in other beneficial effects. Good compaction is achieved by operating up and down the working face between 3 and 5 times on 0.3 - 0.6 m layers of waste until no further compaction occurs. The top deck of the cell must also be compacted by running across the top, keeping it as level as possible. This will typically occur once per week or in combination with collection frequency and nature of the waste.

5.2.6 Cell Completion

Cover soil will be placed over exposed compacted waste cells or portions of waste cells. A minimum of 0.3 m of cover shall be placed over the deck and 0.1 m over the slope of the cell. Use no more fill than necessary. When the cell is completed, no waste should be visible.



1. Build berm, 2 m high. Dump garbage near the berm. The maximum width of the working exposed face used for dumping should be as small as practical and not exceed 12 m.

2. Drive over the garbage 3 to 5 times with a dozer or other equipment as appropriate. Work the garbage up the berm a little at a time to pack it. Do this daily when material is deposited in the landfill.

3. Alternate between dumping and packing garbage until packed garbage is 2 m high, approximately.

4. When garbage at the working face is 3 m wide, cover garbage with 0.3 m of granular material over the deck of the cell and 0.1 m between cells to complete a partial cell, approximately. Repeat steps 1 - 3 across the width of the landfill until a cell is completed.

5. Repeat steps 1 to 4 until site is full. Then cover all garbage with about 0.3 m of granular material. Pack and add more granular material until top is level.

6. Build new 2 m berm on top of cells.

7. Repeat steps 1 to 5.

8. To close out site, put 0.6 m of granular material on cells then pack with bulldozer so that water runs off.

Figure 1. Waste Cell Construction for Mine Site Area Method Landfill

5.3 Cover Soil

5.3.1 Excavation

Excavation of soil for cover material shall only be made from designated "borrow" areas. Working cover stockpiles are to be placed within the perimeter of the approved landfill pad where they will be accessible to the working face. However, they are not to be located where they may block truck travel or filling operations.

5.3.2 Placement of Final Cell Cover

Use of soil for intermediate and final cover should be placed in the following manner:

a. When using a dozer, push cover soil up the slope and feather it out as evenly as possible. Do not permit the tracks of the equipment to spin as you traverse the compacted slope. This action will tear up the waste and it may be necessary to compact the waste again in order to reapply the cover material.
b. When a cell or portion of a cell has reached the final planned grade and width, a final cover of compacted soil should be placed. A minimum of 0.3 m of cover shall be placed over the deck and 0.1 m over the slope of the cell. Use no more fill than necessary.

5.4 Hard-to-Handle Wastes

Certain wastes acceptable at the Mine Site Landfill require special handling. The following are basic methods to be used when managing hard-to-handle waste.

5.4.1 Bulky Waste

a. **Crushable Items:** Such items (e.g. furniture and appliances) should be dumped at the toe of the working face if traffic permits. Use the dozer to crush the item on solid ground, and then push it to the toe of the working face. Fill in any holes with regular waste.
b. **Demolition Debris:** Spread out bulkier pieces of concrete, lumber, and other debris evenly at the toe of the working face. Place regular wastes on top of the demolition wastes.
c. **Long Items:** Long, awkward items, such as pipe, rolls of paper and plastic should be dumped at the toe of the face, placed parallel to the working face, and covered with regular waste. The dozer should be driven over these items slowly to prevent overturning.
d. **Large Metal Wastes:** Metal wastes, such as pipes, rolls of cable, and wires should be placed directly at its position of disposal and covered by household or demolition wastes (bridged). This will prevent unnecessary machine damage and shutdown.

5.4.2 Low Density Wastes

Waste types such as synthetic fibers, loose plastic film or foam, and rubber and plastic scraps or shavings, require special handling. These materials present problems because they rebound after being run over by the dozer. Spread the lightweight material into 1 to 2 foot deep layers, and then cover it with regular waste, compacting as usual at base of cell. These wastes should be compacted until the operator can no

longer detect that the surface of the waste layer is being depressed more than it is rebounding. The weight of the regular waste tends to keep the low-density material down.

5.4.3 Powdery Wastes

Wastes such as sawdust and ash also require special handling. These wastes are problems because they are stirred up by the equipment and blown by wind. Once in the air, they may be harmful to personnel if they are inhaled or contact the skin. Personnel not working in enclosed cabs should wear protective clothing and respirators if dust becomes airborne. Some powdery wastes may be wetted down with water from a water truck and then covered immediately with soil or regular refuse. This procedure will help reduce blowing and dusting of the powdery waste. If water is not available, cover the powdery wastes with soil or refuse to reduce blowing and dusting of the waste.

5.5 Maintenance of Completed Cells

5.5.1 Inspection of Completed Areas

As per the Nunavut Water Board Type A Water Licence No: 2AM-MRY1325 Part D Section 19, biannual summer inspection of the landfill earthworks (e.g. berm walls and completed cell) will be completed for signs of cracks and depressions due to settlement. Cracks and settlement will be filled and compacted back to the original grade.

5.5.2 Groundwater Protection System

Due to the permafrost in the area, no groundwater protection system is required.

5.5.3 Surface Water Flow and Quality

Flowing surface water will be prevented from entering the landfill site by the construction of a berm along the upper end of the site (i.e. the berm constructed above for waste placement) and berms along the sides of the site. The landfill site area will be graded 0.5% to promote drainage away from the landfill and prevent pooling of water within the landfill or against the berms.

Appropriate erosion and sediment control measures will be implemented as required through the use of silt fences, etc. Temporary sediment control measures will be used during all construction activities at the site. See the Surface Water and Aquatic Ecosystem Management Plan (BAF-PH1-830-P16-0026) for further details on surface water flow and quality.

5.5.4 Landfill Gas Assessment

Landfill gas is not expected as the deposited waste will be non-hazardous, non-organic and inert. Also, all hazardous chemicals will be diverted from the landfill waste stream and backhauled during the sealift for proper disposal at a licensed facility in Southern Canada. Therefore a landfill gas collection system will not be installed.

5.5.5 Leachate Characteristics

Leachate is not expected as the waste to be deposited in the landfill will be relatively dry, inert and non-hazardous. Therefore no leachate collection system has been included in the design. In addition, a perimeter berm will be constructed surrounding the landfill site. This will redirect surface runoff originating upstream of the landfill site, thereby minimizing the amount of water which might infiltrate the deposited waste.

5.6 Traffic Control and Unloading of Waste

5.6.1 Traffic Flow

Traffic should be kept moving at a safe, steady rate to avoid backlogs and congestion near the working face. Drivers are to back up to the toe of the slope before he/she starts to dump. The driver is to pull straight away slowly from the slope while he/she is dumping.

5.6.2 Aids to Traffic Control

Directional signs, pylons and barricades may be used to help with traffic control and directing trucks to unload the waste at the base of the cell. Ensure proper signage and barricades are in the required locations at the beginning of each day. Relocate signs and barricades as required at the end of each day so that they will be in place and ready for the next day's operation.

5.6.3 Separation of Vehicles

Due to the risk of dump trucks and trailers overturning, only one vehicle is to be unloaded at the face at a time, this includes vehicles being unloaded by hand.

5.6.4 Load-on-Fire Procedures

Loads-on-fire are wastes that are either on fire or that are smouldering or smoking within a vehicle or when deposited at the working face. In the event of Loads-on-fire, site personnel are to call Code 1 immediately (Appendix C).

5.6.5 Prevention of Scavenging

Scavenging by employees, visitors and local people travelling through is not permitted. Scavenging in a waste pile is a safety hazard with a high risk of injury and is strictly prohibited.

5.6.6 Site User Rules

Landfill staff should know all site user rules and watch for violations. User rules (Appendix B) and wastes acceptable for disposal in the landfill (Appendix A) are to be posted at the entrance to the landfill and at the working face. All violation of landfill user rules shall be recorded by landfill staff and reported to the Site Services Supervisor.

5.6.7 Emergency Procedures

Site personnel shall be familiar with proper emergency procedures and are expected to know their role in all possible emergency situations. Refer to the Emergency Work Instructions in Appendix C of this manual for more details.

5.7 Landfill On-Site Roadways

5.7.1 Road Construction

On-site access roads for transporting waste to the working face and landfill maintenance shall only be constructed under the approval of the Environmental Manager and according to engineered design specifications.

5.7.2 Road Maintenance

a. **Maintenance of Gravel Roadways:** Roadways that are made in native or filled soil and are heavily travelled require routine maintenance. These roads should be graded and re-compacted as required to re-establish proper road grades.
b. **Filling of Areas Where Settlement Occurs:** When all-weather roads are constructed on the tundra, settlement of the filled area may cause cracks to form in a road or cause the slope of a road to change. Cracks should be filled with material that is compatible with the roadbed. The area of a sloped road where the slope has changed drastically should be built-up with material compatible with the roadway until the desired elevation is achieved.
c. **Maintenance of Drainage Culverts:** All drainage culverts should be kept free of obstructions and debris. All drainage crossings should be identified with staking prior to the winter so that they can be found and opened in advance of freshet. Prior to the onset of freshet, all drainage culverts shall be opened and ready to accept water flow.

5.8 Preparation for Weather Conditions Affecting Landfill Operation

Wind and white out conditions caused by storms during the winter and spring freshet may have an impact on landfill operations. The following precautions shall be followed.

5.8.1 Wind

In preparation for wind storms, the working face shall be compacted and covered as practical to reduce the width of the exposed face. Litter fences should be installed prior to windy weather and relocated as required.

5.8.2 White Out Conditions Caused by Winter Storms

Under severe white out conditions caused by some winter storms, the Site Services Manager/Superintendent may declare the landfill temporarily closed if conditions at the landfill cannot be made safe to operate.

5.8.3 Freshet

Prior to the spring melt of freshet the Site Services Supervisor will take the following precautions to minimize the impact of the water flow from freshet:

a. Ensure all culverts are cleared prior to freshet.
b. Remove all excess snow from the landfill pad and completed cell slope to minimize water accumulation on the pad.
c. Install silt fencing or other control devices if required on drainage that contains silt as a result of landfill erosion.

5.9 Inspection, Environmental Monitoring and Reporting

5.9.1 Routine Inspections

Routine visual inspections will be completed every week on the Mine Site Landfill Inspection form (See the Environmental Protection Plan BAF-PH1-830-P16-0008 section 3.7) by the Environment Department for various components of the landfill, including:

- General site area
- Litter control
- Storm water runoff control
- Vector attractants
- Wildlife observations
- Wildlife signs

5.9.2 Environmental Monitoring

In addition to weekly inspections, the Environment Department will conduct surface water monitoring on a seasonal basis for compliance monitoring purposes.

5.9.2.1 Water Sampling

As per the Nunavut Water Board Type A Water Licence No: 2AM-MRY1325 Part F Section 22, seepage sampling will be undertaken during the open water season at two locations downstream of the landfill. Sampling parameters will include: pH, alkalinity, conductivity, total dissolved solids (TDS), total suspended solids (TSS), phenols, nutrients, anions, total organic carbon (TOC), dissolved organic carbon (DOC), total metals, total petroleum hydrocarbons, oil & grease, and trace Arsenic and Mercury. An appropriate number of samples (approximately 10% of the total number of samples) will be collected for Quality Assurance / Quality Control.

Water sampling will continue to be undertaken in the receiving water (Sheardown Lake) as part of routine affects monitoring. Groundwater monitoring is not required as the landfill is underlain by permafrost and any runoff or seepage daylights upstream of the current monitoring locations. In consideration that the landfill is situated in a permafrost area with little to no groundwater present. Thus, impacts to groundwater are not expected.

5.9.2.2 Ground Temperature Monitoring

It is expected that the permafrost active layer will progress into the landfill waste and cover material. Therefore, ground temperatures are not expected to increase due to the presence of the landfill or the types of non-hazardous waste disposed in the landfill.

During regular landfill inspections, signs of ground warming will be monitored by watching for indicators such as soil creep, settling and slumping, and areas of melted snow, for example.

5.9.3 Reporting

Annual reporting regarding the landfill will be incorporated into the Annual QIA and Nunavut Water Board Annual Report. The report will consist of information such as:

- Total volume of waste deposited in the landfill site during the previous calendar year
- Progression of the landfill site development, indicating the landfill site location currently in use, and any areas that have been closed
- Monitoring results
- Photographs as required

5.9.4 Summary of Monitoring and Reporting

Monitoring/Reporting	Frequency	Department Responsible	QA/QC
Overall Site Inspection (runoff, waste composition, litter control and placement, wildlife signs)	Weekly	Environment	Management review of records to confirm proper site operation
Volume Deposited in Landfill	Quarterly	Site Services	Management review of records to confirm proper site operation
Materials Composition of Waste	Whenever deposition occurs	Site Services	Management review of records to confirm proper site operation
Surface Water (Seepage) Sampling Downstream of Landfill	During Open Water Season	Environment	Routine QA/QC Sampling (equivalent to 10% of samples taken)
Earthworks Inspection (berm settlement, ground temperature warming, erosion, cracks, etc.)	Biannually during the summer	Site Services (Geotechnical Engineer Consultant)	Management review of report to confirm proper site operation
Landfill Report - incorporated into Annual QIA and Nunavut Water Board Annual Report	Annual	Environment	n/a

6 REFERENCES AND RECORDS

- Nunavut Mine Health and Safety Act and Regulations
- Canadian Standards Association
- Nunavut Water Board Type A Water Licence No: 2AM-MRY1325
- Commercial Lease No.: Q13C301
- Waste Management Plan (BAF-PH1-830-P16-0028)
- Hazardous Materials and Hazardous Waste Management Plan (BAF-PH1-830-P16-0011)
- Surface Water and Aquatic Ecosystem Management Plan (BAF-PH1-830-P16-0026)
- Environmental Protection Plan (BAF-PH1-830-P16-0008, Section 3.7)
- Waste Sorting Guidelines (BAF-PH1-830-P25-0001)
- Open Burning of Untreated Wood, Cardboard and Paper Products Procedure (BAF-PH1-300-PRO-0001)

Appendix A
Potential Pollutant Sources and Best Management Practices Summary Table

Area	Activity	Pollutant Source	Pollutant	Best Management Practices
Landfill	General landfill operations	Soil Erosion	Sediment	- Maintain design slopes - Repair all berm and cover areas experiencing settling or erosion - No cuts permitted into the tundra during landfill construction or operation - Silt fences installed at any drainage site experiencing sedimentation due to soil erosion
Landfill	Fueling of heavy equipment	Diesel fuel	Diesel fuel	- Fueling is completed in accordance with the Baffinland fueling procedure. - Personnel are trained on the procedure for fueling
Landfill	Unloading waste at landfill	Improper segregation or direction of non-permitted wasted	Hazardous waste or non-permitted waste	- Following Baffinland's Waste Sorting Guidelines - The inspection of all landfill waste prior to unloading/disposal, as outlined in this manual.
Landfill	Unloading waste at landfill	Hazardous material spill	Hazardous waste	- Following the Baffinland Spill Contingency Plan when responding to spills

Landfill & Surrounding Area	General landfill operations	Landfill working face	Litter	- Landfill operations manual contain best management practices including:
				  - Minimizing active working face
				  - Compaction & cover plan
				  - Use of litter fences

Appendix B
Mine Site Non-Hazardous Solid Waste Landfill User Rules

1. **RESTRICTED ACCESS – ONLY SITE SERVICES PERSONNEL ARE ALLOWED TO ENTER THE LANDFILL FACILITY.**
2. **All waste is to be inspected prior to dumping – Contact the Site Services Supervisor for pickup and inspection.**
3. **No liquid or hazardous waste is accepted at this landfill.**
4. **Vehicles shall follow posted speed limits and directions to the unloading area - Unloading in other areas is strictly prohibited.**
5. **Dump waste immediately behind the vehicle as close to the toe of the working face as possible.**
6. **No Unloading by Rapid Acceleration or Deceleration.**
7. **No scavenging is permitted.**
8. **No open fires or the burning of waste is allowed at the landfill.**
9. **All spills are to be stopped if safe to do so, and immediately reported to the Site Services Supervisor/Environment Department.**
10. **PPE is required to be worn at landfill area.**

In case of Emergency – Immediately contact the Site Services Supervisor or call a Code 1, if necessary, providing your location, your name and the nature of the emergency.

Appendix C
Mine Site Landfill Work Instructions

Appendix C focuses on work instructions. Specific work instructions concerning landfill operations and emergencies have been documented in order to establish standard policies and practices for Site Services personnel working at the Mine Site Landfill. These topics will be reviewed periodically at routine safety meetings, which will allow operators to keep up-to-date on any changes in standard operations. Site Services personnel are expected to be familiar and comply with the work instructions relating to their areas of responsibility.

1. General Site Maintenance

Landfills require general maintenance throughout the year in order to keep them orderly and clean. Much of this maintenance is in anticipation of permit requirements and seasonal weather changes.

a. Access roads are to be maintained and graded to eliminate ruts, cracks and settling.
b. Maintain drainage, keep road culverts and landfill drainage free of debris.
c. Define a critical landfill perimeter and mark perimeter with stakes and/or signs prior to winter to facilitate identification.

2. Dust Control

Place dusty loads at the toe of the face and cover as quickly as possible.

Benefit of Compliance to Instruction:

- Compliance with operating permit
- Cleaner, safer work environment
- Reduced impact on surrounding environment

3. Litter Control

The control of litter is an essential part of our permit conditions and readily evident to all who drive by or onto the landfill. In an effort to maintain compliance with our permit and reduce the amount of time and effort required for this task, the following procedures are to be followed:

Prevention of Litter at Working Face:

a. Minimize the length of the working face to reduce the size of the face exposed to wind. The maximum length of the exposed cell face should not exceed 12 meters at any time.
b. Keep waste well confined at the working face to reduce the amount of waste susceptible to wind.
c. Deposit waste at the toe of the face and spread it upward.
d. Cover the compacted waste as soon as possible to minimize blowing litter.

Control with Litter Fences:

a. Position fences near the working face as wind and fill operations change.
b. Move or lengthen semi-permanent litter fences that are strung around the area to conform to filling operations and prevent migration of litter off site.

Litter Pickup:

a. Personnel are to pick any litter off the fences to prevent the fence from being clogged and subject to overturning by the wind.
b. Promptly pick up any litter not trapped by the fences to prevent off-site migration.

Litter in Heavy Wind Conditions:

a. Install litter fences prior to windy weather and relocate as required.
b. If lightweight material cannot be contained within the site, place intermediate cover over the waste to prevent it from blowing.

Benefit of Compliance to Instruction:

- Compliance with operating permit
- Reduction in amount of litter migrating out of the landfill area
- Minimize impact to surrounding environment
- Reduce the amount of time dedicated to picking up litter

4. Vector Control

Vectors (any wildlife that carry diseases) are generally not present at a properly operated and maintained non-hazardous solid waste landfill (no domestic waste). The provisions of source segregation and waste inspection at the landfill prior to unloading waste will safeguard against vector problems. Well-compacted wastes and cover material will effectively prevent vectors from becoming attracted and burrowing into waste materials. The following are basic guidelines to ensure proper vector control on site:

a. All waste is to be inspected at the landfill prior to unloading at the working face to confirm no domestic or food waste is present.
b. Maintain a narrow working face and cover all un-worked areas to minimize animal foraging at the site.
c. Cover waste on all unused slopes.
d. Ensure good compaction of the cover material to discourage animals from burrowing through it.
e. Keep equipment, storage and leisure areas free of debris and food waste to prevent vectors from establishing residence in or near areas where employees and contractors work.

Benefit of Compliance to Instruction:

- Protects the health and safety of employees
- Eliminates potential exposure pathways of disease to employees
- Reduces risk of contact with vectors and scavengers
- Maintains compliance with operating permit

5. Building and Equipment Fires

In the event of a fire, site personnel are to call Code 1 immediately

6. Fire in Load

“Fire in load” refers to a load of waste within a vehicle that is either on fire and/or smoldering or smoking prior to discharge to the landfill. In the event of Loads-on-fire, site personnel are to call Code 1 immediately.

7. Subsurface Landfill Fires

Warning signs may include:

- Smoke and/or heat waves emanating from cracks and/or fissures;
- Localized settlement (sinkholes up to several meters in diameter);
- The odor of burning plastic/refuse may be present

BEWARE! The surrounding area may not be stable. The rapid decomposition of refuse by combustion may have created large voids underground.

Safety Procedures

1. If an area is suspected of having an underground fire, call a Code 1 and take control of the scene by blocking access to the landfill area until Mine Rescue Team personnel arrive onsite. Ensure all personnel near the suspected landfill fire are notified and/or vacated as necessary.
2. Try to stay upwind of any smoke and not breathe the fumes, if any.
3. The Mine Rescue Team Lead will evaluate the conditions and develop a plan to safely deal with the fire (Note: Pumping water into the ground may not stop the smoldering and will not prevent future fires. Smothering with dirt is the preferred option).
4. Notify the Baffinland Environment department to evaluate the incident and confirm the repair plan is in compliance with permits.
5. Once the fire is extinguished and the situation secured, look for other cracks and/or depressions in the area and schedule their repair. (They could be the source of air that allowed the fire to start originally).
6. Complete repairs to the landfill structure. Note completion of work in site log along with fire location for future reference.

Appendix E -
Waste Sorting Guidelines

(Document #: BAF-PH1-830-P25-0001 r1)

Baffinland

WASTE SORTING GUIDELINES

Why sort waste?

To protect the health and safety of site personnel.

To minimize contamination, wildlife attraction, and other adverse environmental impacts.

Where to sort waste?

Workplaces and the Waste Sorting Areas (and future Waste Management Buildings).

Who should sort waste?

Everyone.

All who manage, handle, store and/or dispose of any of the materials mentioned in these guidelines.

- *All employees and contractors generating waste are responsible for ensuring that it is labeled and sorted correctly.*
- *Employees and contractors are also responsible for contacting BIM Site Services Supervisor on channel 4 when waste containers are full and ready for pick-up.*
- *For unusual or hard to segregate waste types, please contact the Environmental Department.*

INCINERATOR WASTE

Disposal Instructions

Indoors – All waste bins indoors unless marked otherwise.
Outdoors – Steel bins with hinged lid on top.

Acceptable Waste

Cardboard
Food Scraps
Oily Rags
Paper
Small Plastics

Note: All clean untreated wood (e.g. lumber, timber, pallets) to be stockpiled and taken to the wood storage area.

LANDFILL WASTE

Disposal Instructions

Outdoors – Large open top red roll-off dumpsters
Access to the Mine Site Non-Hazardous Landfill is for **Authorized Personnel Only**. Landfill operators should refer to the landfill user rules for more information.

Acceptable Waste

Concrete
Empty Clean Containers
Glass
Metal

Bulky Clean Plastics (i.e. packaging, clean liner)
Plywood and other treated wood products

HAZARDOUS WASTE

Waste Type	Disposal Instructions
Absorbent (used)	White Quatrex bag or sealable drum
Aerosol Cans	Labeled bins/buckets indoors; sealable drums outdoors
Antifreeze	Cubes or sealable drums
Batteries (AA, 9V, etc.)	Labeled bins/buckets indoors
Batteries (vehicle)	Black Quatrex bag
Contaminated Soil	White Quatrex bag or sealable drums
Contaminated Water	Sealable drums
Electronic Waste	White Quatrex bag
Fluorescent Bulbs	Labeled bins/buckets indoors
Mixed Contaminated Waste Containers	White Quatrex (antifreeze, grease, oil, polymer, etc.)
Waste Fuel	Sealable drums
Waste Grease	Sealable drums
Waste Oil	Cubes or sealable drums
Waste Oil Filters	Sealable drums

ᐊᓂᑕᐅᓂᐊᕐᑐᓐᓂᒃ ᐊᑦᔨᒋᖏᑐᓐᓂᒃ ᐊᕕᒃᑎᕆᓗᓐᓂ ᐊᑐᐊᒐᖅ

ᖃᓄᐃᒪᑦ ᐊᒃᑕᕐᓗᑯᑦ ᐊᕕᒃᑐᕆᐊᖃᕐᐸᑦ ?

ᐃᖃᓇᐃᔭᕐᑎᑦ ᓴᐳᑎᓯᒪᓗᒋᑦ ᐊᓐᓂᐊᖃᑕᐃᓕᓂᑯᑦ ᐊᒪᓗ ᐊᑕᕐᓇᕐᑕᐃᓕᓂᑯᑦ

ᓱᕈᕐᑎᕆᓗᐊᕐᑕᐃᓕᒪᓗᓐᓂ, ᐅᒪᔪᑦ ᐅᓂᓕᕐᑎᑕᐃᓕᒪᓗᒋᒃ, ᐊᒪᓗ ᐊᓯᖏᑦ ᐊᕙᑎᒥᒃ ᐱᐅᔪᓂᕐᑎᑦᑎᔭᑐᑦ

ᓇᒧᑦ ᐊᒃᑕᕐᓗᑯᑦ ᐊᕕᒃᑐᕐᑕᐅᓕᑦ?

ᐃᖃᓇᐃᔭᕐᕕᑦ ᐊᒪᓗ ᐊᒃᑕᕐᓗᑯᖃᐅᑎᑦ ᓯᕗᓂᒃᓴᑎᓐᓂ ᐊᒃᑕᕐᓗᑯᓐᓂᒃ

ᑭᐊ ᐊᒃᑕᕐᓗᑯᑦ ᐊᕕᒃᑐᕐᓂᐊᕐᐸᐃᑦ ?

ᑭᑯᑐᐃᓇᑎᐊᑦ. .

ᐊᖓᔪᖅᑲᐅᑎᐅᔪᑦ, ᓯᓇᑯᑕᓕᕆᓕᔨᑦ ᐊᒪᓗ/ᐅᕙᓗᓐᓂᑦ ᐊᒃᑕᕐᓗᑯᓐᓂᒃ ᐊᓂᑎᔨᐅᖃᑕᕐᑐᑦ ᐊᑐᐊᕐᓗᒋᑦ ᑎᑎᕋᕐᓯᒪᔪᑦ.

- *ᐃᖃᓇᐃᔭᕐᑎᓕᒪᑦ ᐊᒪᓗ ᑲᓐᑐᓚᒃᓯᒪᔪᓕᒪᑦ ᐊᓂᑕᐅᔫᒃᓴᓐᓂᒃ ᓴᕿᑭᕙᓕᐊᔪᑦ ᐱᓕᕆᐊᒃᓴᖃᕐᑐᑦ ᐊᓂᑕᐅᔫᒃᓴᑦ ᑎᑎᕋᕐᓯᒪᑎᐊᕐᐸᒃᓗᑎᒃ ᐱᓕᕆᐊᒃᓴᖃᕐᑐᕐ.*
- *ᐃᖃᓇᐃᔭᕐᑎᑦ ᐊᒪᓗ ᑲᓐᑐᓚᒃᑐᔪᑦ ᐱᓕᕆᐊᒃᓴᖃᑲᓐᓂᕐᑐᑦ ᐸᕙᓐᓇᓚᑰᓐᓂ ᓯᓇᑯᑕᓕᕆᓕᔨᑦ ᐅᖃᓚᕕᐅᕙᒃᓗᑎᒃ ᐊᓂᑕᐅᔫᒃᓴᑦ ᓇᒪᒃᓯᒐᖓᑕ*
- *ᐊᓂᑕᐅᔫᒃᓴᑦ ᐊᕕᒃᑐᑕᐅᔪᓇ ᖏᑲᖓᑕ ᐅᖃᓚᕕᐅᖃᑕᕐᓗᑎᒃ ᐊᕙᑎᓕᕆᔨᑯᑦ*

ᐊᒃᑕᕐᓗᑯᓐᓂᒃ ᐃᑭᑎᕕᒃ

ᐊᓂᑕᐅᓂᐊᕐᑐᓐᓂᒃ ᐱᓕᕆᓗᓐᓂ ᐊᑐᕐᑕᐅᔫᒃᓴᐃᑦ

ᐃᒡᓗᑉ ᐃᓗᐊᓐᓂ - ᐊᒃᑕᕐᕕᓕᒪᑦ ᐊᓯᐊᖑᓂᕋᕐᑕᐅᓗᑎᒃ ᑎᑎᕋᖃᖏᑐᐊᕐᐸᑦᑕ ᓯᓚᒻᒥ- ᐊᒃᑕᕐᕕᑦ ᓴᕕᐅᓗᑎᒃ ᐊᒪᓗ ᖁᓚᓐᓂ ᐅᒃᑯᐊᖓ ᒪᑐᐃᕐᑕᕐᓗᓐᓂ ᐊᒪᓗ ᐊᑦᑕᑕᐅᑎᖃᕐᓗᓐᓂ.

ᖃᓄᐃᒋᔭᐅᖏᑐᖅ ᐊᒃᑕᕐᓗᑯ

ᐃᑦᔪᖅ ᐊᓪᓕᓚᔪᖅ
ᓂᕆᕐᓗᑯᑦ
ᐊᑦᓚᕈᑎᑦ ᐅᕐᓱᕈᔪᐃᑦ
ᐸᐃᐸᑦ
ᒥᑭᔪᑎᑦ ᐊᐅᒃᑕᔪᑦ

ᐅᕐᓱᕆᔭᐅᔭᕆᐊᓕᒃ: ᓴᓗᒪᔪᑦ ᕿᔪᑐᐃᓇᐃᑦ(ᓱᕐᓗ, ᕿᔪᐃᑦ ᐊᕿᒃᓯᒪᔪᑦ, ᕿᔪᐃᑦ ᖃᓄᐃᓕᒋᐊᕐᓯᒪᖏᑐᕐ,ᑲᑎᓯᒪᔪᑫ) ᑲᑎᑕᐅᔭᕆᐊᓕᑦ ᐊᒪᓗ ᕿᔪᖃᕐᕕᖑᑦ ᐊᖃᓪᔅᑕᐅᔭᕆᐊᓕᕐ.

ᓴᐅᔭᐅᔫᒃᓴᖅ ᐊᒃᑕᕐᓗᑯ

ᐊᓐᓂᑎᓂᐊᕐᓗᓐᓂ ᒪᓕᒃᑕᐅᔫᒃᓴᑦ

ᓯᓚᒥ – ᐊᖏᔪᖅ ᐊᒃᑕᕐᕕᒃ ᖃᖖᒍᒃᑦ ᐊᐅᐸᕐᑐᒻᒥ ᒪᑐᖃᕐᓗᓐᓂ ᐃᓱᕈᓇᕐᓂᖅ ᓴᕕᔅᓴᕐᓂᐊᕐᕕᐅᑉ ᖁᐊᕐᓴᕐᓇᖏᑐᓄᑦ ᐊᒃᑕᕐᕕᖑᓄᑦ ᐊᖏᕐᑕᐅᓯᒪᔪᑦ ᐃᓱᕈᓇᕐᑐᑦ. ᓴᐅᔭᐅᕕᖓ ᐃᖃᓇᐃᔭᕐᑎᑦ ᖃᐅᔨᓇᓯᐊᖃᓂᕐᓗᑎᒃ ᐊᑐᐊᒐᕆᔭᒥᖕᓂᒃ.

ᓇᒻᒪᒋᔭᐅᔪᖅ ᐊᒃᑕᕐᓗᑯᑦ

ᕿᑯᖅ
ᐊᒃᑕᕐᕕᑦ ᓴᓗᒪᔪᑦ ᐃᓗᓕᖃᖏᑐᑦ
ᐃᒐᓚᖅ
ᓴᕕᒃ
ᐳᕐᓯᒪᔪᑦ ᓴᓗᒪᔪᑦ ᐊᐅᒃᑕᔪᑦ (ᓱᕐᓗ ᐳᒃᓴᐃᑦ, ᓴᓗᒪᔪᑦ ᓱᓗᐊᕐᑯᑕᐃᑦ)
ᕿᔪᒃ ᓴᑐᐱᐊᖅ /ᐸᓚᐃᕗᑦ ᐊᒪᓗ ᐊᓯᖏᑦ ᕿᔪᖑᑦ ᓴᓇᓯᒪᔪᑦ

ᖁᐊᕐᓴᕐᓇᕐᑐᑦ ᐊᒃᑕᕐᓗᑯᑦ

ᖃᓄᐃᑐᓐᓂᖏᑦ ᐊᒃᑕᕐᓗᑯᑦ	ᐊᓐᓂᑎᓂᐊᕐᓗᓐᓂ ᒪᓕᒃᑕᐅᔫᒃᓴᑦ
ᐊᑦᓚᕈᑎᑦ ᒥᐅᓯᒪᔪᑦᓗᐊᕐᑕᕐᑐᑦ (ᐊᑐᕐᑕᐅᓯᒪᔪᑦ)	ᖃᐅᓗᕐᑕᖅ ᐃᒃᐱᐊᕐᔪᒃ ᐅᕙᓗᓐᓂᑦ ᖃᑕᐅᔭᖑᐊᖅ ᒪᑐᑕᕐᑐᖅ
ᖃᑦᑕᕐᔪᐃᑦ ᐳᓚᓕᑦ	ᐊᒃᑕᕐᕕᑦ ᑎᑎᖃᖃᑐᑦ ᐊᒃᑕᕐᕕᑦ ᐃᒡᓗ ᐃᓕᐊᓐᓂ: ᓯᓚᒥ ᒪᑐᑕᕐᑐᓐᓂᒃ ᐊᑦᒃᑕᕐᕕᑦ
ᖁᐊᕐᑕᐃᓕᒪᔪᑎᑦ	ᑭᐸᕆᒃᑐᑦ ᐅᕙᓗᓐᓂᑦ ᒪᑐᑕᕐᑐᑦ ᖃᑕᐅᔭᖑᐊᑦ
ᕙᑕᓕᑦ (AA, 9V, ᐊᒪᓗ ᐊᓯᖏᑦ)	ᐊᒃᑕᕐᕕᑦ ᑎᑎᖃᖃᕐᑐᑦ / ᖃᑕᕐᔪᐃᑦ ᐃᒡᓗ ᐃᓗᐊᓐᓂ
ᕙᑕᓕᑦ (ᓄᓇᓯᐅᑎᓄᑦ)	ᕿᕐᓂᕐᑕᑦ ᐃᒃᐱᐊᕐᔪᐃᑦ
ᓄᓇ ᐅᕐᓯᕐᓯᒪᔪᖅ	ᖃᐅᓗᕐᑕᖅ ᐃᒃᐱᐊᕐᔪᒃ ᐅᕙᓗᓐᓂᑦ ᖃᑕᐅᔭᖑᐊᖅ ᒪᑐᑕᕐᑐᖅ
ᐃᒻᒪᖅ ᓴᓗᒪᖏᑐᖅ	ᐸᖖᒐᐃᕐᑕᕐᑐᑦ ᖃᑕᐅᔭᕐᔪᐊᑦ
ᐅᐊᔭᓄᕐᑐᑦ ᐃᒋᑕᐅᔫᒃᓴᑦ	ᖃᐅᓗᕐᑐᑦ ᐃᒃᐱᐊᕐᔪᐃᑦ
ᑕᑭᔪᑯᑕᑦ ᐃᑭᑕᔪᑦ	ᐃᒋᑎᕕᑦ ᑎᑎᖃᕐᑐᑦ/ᖃᑕᕐᔪᐃᑦ ᐃᒡᓗᑉ ᐃᓗᐊᓐᓂ
ᐊᑦᔨᒋᖏᑐᓄᑦ ᓱᕈᕐᓯᒪᔪᓄᑦ ᐊᒃᑕᕐᕕᒃ	ᖃᐅᓗᕐᑐᑦ ᐃᒃᐱᐊᕐᔪᐃᑦ (ᖁᐊᕐᑕᐃᓕᔪᑎᑦ, ᐅᕐᓯᕐᑎᕈᑎᑦ
ᐅᕐᓱᐊᓗᒃ ᓱᕈᕐᓯᒪᔪᖅ	ᐸᖖᒐᐃᕐᑕᕐᑐᑦ ᖃᑕᐅᔭᕐᔪᐊᑦ
ᐅᕐᓯᕐᑎᕈᑎ ᓱᓯᕈᕐᓯᒪᔪᖅ	ᐸᖖᒐᐃᕐᑕᕐᑐᑦ ᖃᑕᐅᔭᕐᔪᐊᑦ
ᐃᓚᒃᓴᐅᑦ ᓱᕈᕐᓯᒪᔪᖅ	ᑭᐸᕆᒃᑐᑦ ᐅᕙᓗᓐᓂᑦ ᒪᑐᑕᕐᑐᑦ ᖃᑕᐅᔭᕐᔪᐊᑦ
ᐃᒋᑕᐅᔫᒃᓴᑦ ᐅᕐᓱᐅᓗᖑᑦ ᓱᕈᔭᐃᑯᑎᑦ	ᐸᖖᒐᐃᕐᑕᕐᑐᑦ ᖃᑕᐅᔭᕐᔪᐊᑦ

Appendix F -
2015 Work Plan and Updated Site Layout Drawings

- Please refer to the 2015 Work Plan submitted to the NWB and QIA on October 31, 2014. Subsequently, an addendum to that Work Plan was submitted on December 12, 2014.
- Included here are the updated Site Layout Drawings as submitted with the Addendum to the Work Plan.

H349000-2000-00-015-0021

MILNE INLET

AANDC NUNAVUT LEASE 47H/16-1-2
SHIPLOADER
ORE DOCK
MOORING BUOY
SEALIFT BARGE LANDING AREA
RAMP TO BEACH
LAYDOWN AREA
FUEL TANK FARM
ORE STOCKPILE SETTLING PONDS
EFFLUENT DISCHARGE LOCATION N 7976341 E 503639
HAZARDOUS WASTE BERMS
LAYDOWN AREA
EXISTING HTO CABIN
FUTURE AIRSTRIP
SERVICES AREA PAD
SITE FACILITIES, INCLUDING:
- MAINTENANCE BUILDING x 2
- EXTEND WELDING SHOP BUILDING
- WORKSHOP OFFICE BUILDING
- TOROMONT MAINTENANCE BUILDING
- TRUCKWASH

POWER GENERATORS
INCINERATOR HAZARDOUS WASTE BERM
POLISHING WASTE STABILIZATION POND
EXISTING HAZARDOUS WASTE BERM
ORE STOCKPILE PAD
MATRIX CAMP
CAMP INFRASTRUCTURE PAD
SITE FACILITIES, INCLUDING:
- EXTEND ACCOMMODATION COMPLEX
- EMERGENCY RESPONSE OFFICE
- EMERGENCY RESPONSE GARAGE
- UPGRADE SEWAGE TREATMENT PLANT
- UPGRADE POTABLE WATER TREATMENT PLANT
- WASTE MANAGEMENT FACILITY

TRAILER CAMP TO BE REMOVED 2015
ADDITIONAL LAYDOWN AREA
LAND FARM
ROCK QUARRY N0.1 BOUNDARY
POTABLE WATER SUPPLY
CONCRETE BATCH PLANT , CRUSHER AND STOCKPILE
FUTURE POLISHING WASTE STABILIZATION POND
TOTE ROAD
EXTENT OF QUARRY Q1
PERMITTED OPEN BURN PIT AREA
KM2 PLANNED BORROW AREAS

PHILLIPS CREEK

MILNE PORT
MINE SITE

KEYPLAN

FOR INFORMATION

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. DRAINAGE WILL BE DIVERTED AROUND NEW LAYDOWN AREAS AND PADS.

0 50 100 150 200 250
SCALE IN METRES

LEGEND:

- WATER
- QUARRY
- COMMERCIAL LEASE
- AANDC LEASE 47H/16-1-2
- RIVER/STREAM/DRAINAGE
- ROAD
- PROJECT DEVELOPMENT AREA
- PLANNED BORROW AREAS

REV.	ISSUE FOR	AUTH. BY	DATE
C	ISSUE FOR USE	S.M.	T.M. 2014-12-10
B	ISSUE FOR USE	C.L.	T.M. 2014-10-31
A	ISSUE FOR USE	C.L.	A.G. 2014-06-19

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PROJ. DES. COORD. T. THERTELL DATE 2014-10-20	PROJ. ENGR. J. CLELAND DATE 2014-06-19
PROJ. MGR. J. CLELAND DATE 2014-06-19	

Baffinland

MARY RIVER PROJECT

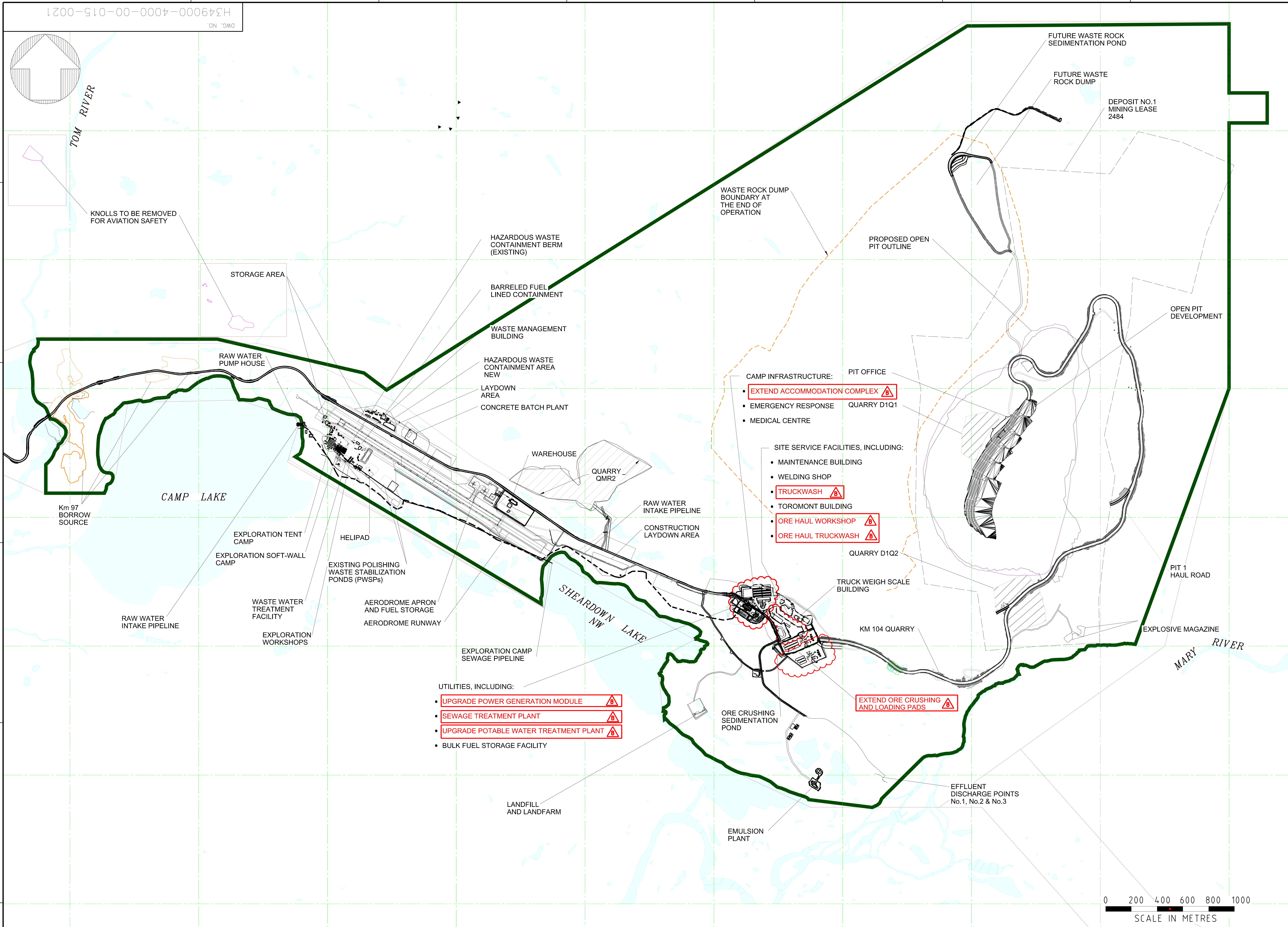
MILNE PORT
INFRASTRUCTURE FOOTPRINT
WORK PLAN 2015

SCALE 1:5000 OR AS NOTED

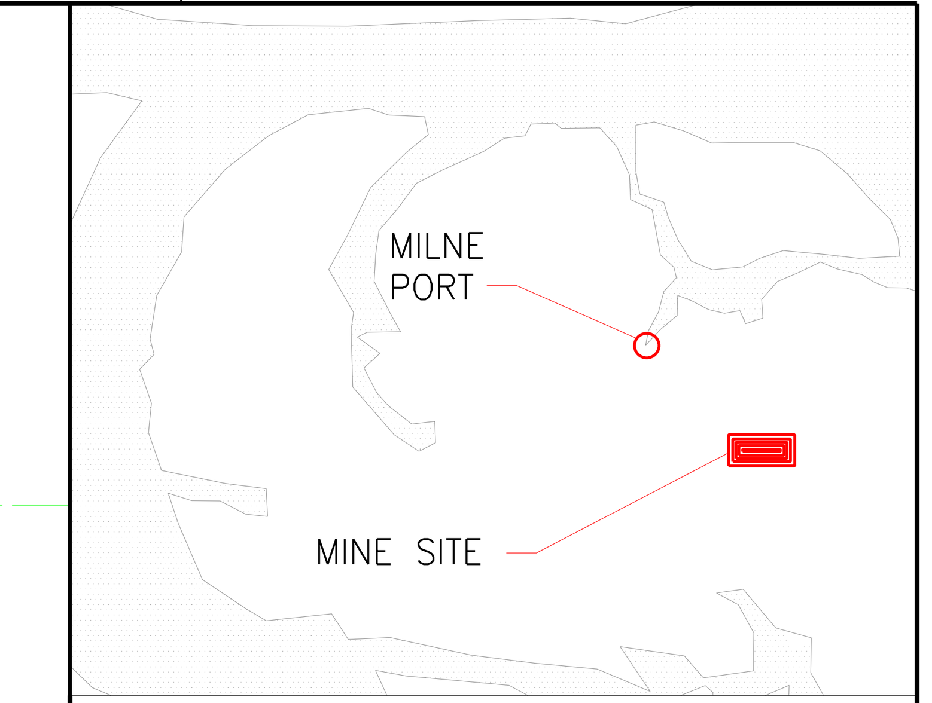
DWG. NO. H349000-2000-00-015-0021

REV. C

DWG. NO. H349000-4000-00-015-0021



TOM RIVER
KNOLLS TO BE REMOVED FOR AVIATION SAFETY
STORAGE AREA
HAZARDOUS WASTE CONTAINMENT BERM (EXISTING)
BARRELED FUEL LINED CONTAINMENT
WASTE MANAGEMENT BUILDING
HAZARDOUS WASTE CONTAINMENT AREA NEW
LAYDOWN AREA
CONCRETE BATCH PLANT
RAW WATER PUMP HOUSE
WAREHOUSE
QUARRY QMR2
RAW WATER INTAKE PIPELINE
CONSTRUCTION LAYDOWN AREA
CAMP LAKE
Km 97 BORROW SOURCE
EXPLORATION TENT CAMP
EXPLORATION SOFT-WALL CAMP
HELIPAD
EXISTING POLISHING WASTE STABILIZATION PONDS (PWSPs)
WASTE WATER TREATMENT FACILITY
RAW WATER INTAKE PIPELINE
AERODROME APRON AND FUEL STORAGE
AERODROME RUNWAY
EXPLORATION WORKSHOPS
EXPLORATION CAMP SEWAGE PIPELINE
SHEARDOWN LAKE NW
UTILITIES, INCLUDING:
• UPGRADE POWER GENERATION MODULE
• SEWAGE TREATMENT PLANT
• UPGRADE POTABLE WATER TREATMENT PLANT
• BULK FUEL STORAGE FACILITY
LANDFILL AND LANDFARM
EMULSION PLANT
ORE CRUSHING SEDIMENTATION POND
EFFLUENT DISCHARGE POINTS No.1, No.2 & No.3
EXTEND ORE CRUSHING AND LOADING PADS
KM 104 QUARRY
TRUCK WEIGH SCALE BUILDING
QUARRY D1Q2
CAMP INFRASTRUCTURE:
• EXTEND ACCOMMODATION COMPLEX
• EMERGENCY RESPONSE
• MEDICAL CENTRE
PIT OFFICE
QUARRY D1Q1
SITE SERVICE FACILITIES, INCLUDING:
• MAINTENANCE BUILDING
• WELDING SHOP
• TRUCKWASH
• TOROMONT BUILDING
• ORE HAUL WORKSHOP
• ORE HAUL TRUCKWASH
WASTE ROCK DUMP BOUNDARY AT THE END OF OPERATION
PROPOSED OPEN PIT OUTLINE
FUTURE WASTE ROCK SEDIMENTATION POND
FUTURE WASTE ROCK DUMP
DEPOSIT NO.1 MINING LEASE 2484
OPEN PIT DEVELOPMENT
PIT 1 HAUL ROAD
EXPLOSIVE MAGAZINE
MARY RIVER
0 200 400 600 800 1000
SCALE IN METRES



KEYPLAN

FOR INFORMATION

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. DRAINAGE WILL BE DIVERTED AROUND NEW LAYDOWN AREAS AND PADS.

LEGEND:

Symbol	Description
(cyan fill)	WATER
(hatch)	QUARRY
(double line)	ROAD
(orange line)	PLANNED BORROW AREA
(purple line)	EXISTING ROCK QUARRY
(blue line)	RIVER/STREAM/DRAINAGE
(dashed line)	RAW WATER INTAKE PIPELINE
(pink line)	COMMERCIAL LEASE
(thick green line)	PROJECT DEVELOPMENT AREA

REV.	ISSUE FOR	AUTH. BY		DATE
B	ISSUE FOR USE	S.M.	T.M.	2014-12-10
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PROJ. MGR. J. CLELAND DATE 2014-10-21	

Baffinland

MARY RIVER PROJECT

MINE SITE
INFRASTRUCTURE FOOTPRINT
WORK PLAN 2015

SCALE 1:15000 OR AS NOTED

DWG. NO. H349000-4000-00-015-0021

REV. B

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

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Appendix G -
Tables of Concordance with Applicable Permits and Licences

- Concordance Table with Type A Water Licence (2AM-MRY1325) Conditions
- Concordance Table with Type B Water Licences (2BE-MRY1421 and 8BC-MRY1416) Conditions
- Concordance Table with Nunavut Impact Review Board (NIRB) Project Certificate.

Table H- 1 shows the Part, number and Condition of the Type A water Licence (Water Licence No: 2AM-MRY1325) and the location within the Waste Management Plan for Construction, Operation and Closure.

TABLE G- 1: CONCORDANCE TABLE WITH TYPE A WATER LICENCE (2AM-MRY1325) CONDITIONS

Part	Number	Condition	Section
D	18	The Licencee shall submit a Construction Monitoring Report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes. The construction summary report shall be prepared by an Engineer(s) in accordance with Schedule D, Item 1.	Within 90 days the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes
D	20	The Licencee shall prevent any chemicals, fuel or wastes associated with the undertaking from entering any Water body.	Section 4.3.1
F	1	The Board has approved with the issuance of the licence, the Plan entitled "Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction Operation, and Closure", dated April 2013.	N/A
F	6	The Licencee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) meters from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.	Section 4.3.1
F	7	The Licencee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an Incinerator System;	Section 4.5
F	8	The Licencee shall test the bottom ash generated by all Incinerator Systems, by using the acceptable test procedures for analyzing residuals, prior to being disposed of at any Landfill Facility. If the composition of the ash makes it unsuitable for disposal at the Landfill facilities, the Licencee shall direct the Waste to an appropriate facility for disposal. The records of analysis results and volumes of ash shall be maintained and provided to an Inspector upon request.	Section 4.5.3
F	9	The Licencee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood, to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.	Section 4.6
F	11	The Licencee shall submit to the Board and the Inspector, thirty (30) days prior to the removal and transfer of waste, a declaration of authorization from any community receiving waste from the project, which clearly states that authorization has been granted for the deposit by the Licencee at the Hamlet's appropriately licenced facilities.	Section 4.3.8 Section 7.4
F	12	The Licencee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.	Section 7.1 Section 7.4

Part	Number	Condition	Section
F	14	The Licencee shall remove any waste generated from temporary and permanent shelters along the tote road and along the railway corridor for treatment at appropriately licenced Waste Management Facilities.	Section 4.3.1 Section 4.3.3
F	30	The Licencee shall maintain records of all Waste backhauled from the Mary River Project and confirmation of proper disposal through the use of Waste manifest tracking systems and registration with the Government of Nunavut, Department of Environment. These records shall be made available upon request, to an Inspector or the Board.	Section 7.1 Section 7.4

TABLE G- 2: CONCORDANCE TABLE WITH TYPE B WATER LICENCE (2BE-MRY1421) CONDITIONS

Part	Number	Condition	Section
D	1	The Licensee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of Water is not impaired, unless otherwise approved by the Board in writing.	Section 4.3.1
D	2	The Licensee shall not practice on-site landfilling or open-burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood so as to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding Waters, unless otherwise approved by the Board in writing.	Section 4.6
D	3	The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.	Section 4.5
D	4	The Licensee shall provide to the Board with documented authorization from all communities in Nunavut receiving Wastes from the Mary River Exploration Project prior to any backhauling and disposal of wastes to those communities.	Section 7.1 Section 7.4
D	5	Licensee shall provide to the Board a copy of the written authorization received from the Licensee of 2AM-MRY1325 at least 30 days prior to backhauling waste from facilities and undertakings under this licence to facilities associated with Licence 2AM-MRY1325.	Section 7.4
D	6	The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of operation at a licensed waste disposal facility.	Section 7.1
D	7	The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector or the Board upon request.	Section 7.1

TABLE G- 3: CONCORDANCE TABLE WITH TYPE B WATER LICENCE (8BC-MRY1416) CONDITIONS

Part	Number	Condition	Section
D	1	The Licensee shall locate areas designated for waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired, unless otherwise approved by the Board in writing.	Section 4.3.1
D	2	The Licensee shall not practice on-site land filling of domestic waste, unless otherwise approved by the Board in writing.	Section 4.7
D	3	The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.	Section 4.5
D	4	The Licensee shall conduct appropriate analyses, to determine the chemical properties or constituents of ash generated from incineration, prior to disposal at an appropriate facility.	Section 4.5.3
D	5	The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, styrofoam, asbestos or painted wood to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing.	Section 4.6
D	6	The Licensee shall provide to the Board, documented authorization from all communities in Nunavut receiving wastes from the Mary River Site Preparation Project, prior to any backhauling and disposal of wastes to those communities.	Section 7.4
D	7	The Licensee shall backhaul and dispose of all hazardous wastes, waste oil and non-combustible waste generated through the course of the operation at a licensed waste disposal site.	Section 7.1 Section 7.4
D	8	The Licensee shall maintain records of all waste backhauled and records of confirmation of proper disposal of backhauled waste. These records shall be made available to an Inspector upon request.	Section 7.1 Section 7.4
D	9	The Licensee shall notify the Inspector and the Board of any contaminated soils, water or waste that is generated under this Licence and stored at any facility constructed under this Licence or by means that is regulated under Licence 2AM-MRY1325 for future disposal. This	Section 7.1 Section 7.4

Part	Number	Condition	Section
		information shall be reported within the annual report required by Part B, Item 4.	
D	10	The Licensee shall not dispose of or store any dredged material associated with the Mary River Site Preparation Project, on land, into or onto any Water body unless approved by the Board in writing.	Section 4.14

Table G-4 shows the number and Condition of the NIRB Project Certificate and the location within the Waste Management Plan for Construction, Operation and Closure.

TABLE G- 4: CONCORDANCE TABLE WITH NIRB PROJECT CERTIFICATE #005

Number	Condition	Section
11	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's Technical Document for Batch Waste Incineration (2010).	Section 4.5 Appendix C
12	Prior to commencing any incineration of on-site Project wastes, the Proponent shall conduct at least one stack test immediately following the commissioning of each temporary and permanent incinerator.	Section 4.5
64	The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures: a) The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures: Installation of an incinerator beside the kitchen that will help to keep the food waste management process simple and will minimize the opportunity for human error (i.e. storage of garbage outside, hauling in a truck (odors remain in truck), hauling some distance to a landfill site, incomplete combustion at landfill, fencing of landfill, etc.); and b) Installation of solid carnivore-proof skirting on all kitchen and accommodation buildings (i.e., heavy-duty steel mesh that would drop down from the edge of the buildings/trailers and buried about a half meter into the ground to prevent animals from digging under the skirting).	This Condition has been addressed in the Environmental Protection Plan (BAF-PH1-830-P16-0008)

Appendix H-Open Burning of Untreated Wood, Cardboard and Paper Products Procedure

(Document #: BAF-PH1-300-PRO-0001)

Baffinland Iron Mines Corporation

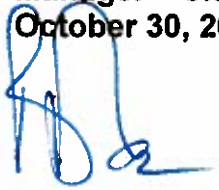
Open Burning of Untreated Wood, Cardboard and Paper Products Procedure

BAF-PH1-300-PRO-0001

Rev 1

Prepared By: Trevor Myers
Department: Environment
Title: Environmental Coordinator
Date: October 30, 2014
Signature:

Approved By: Bikash Paul
Department: Site Services
Title: Manager – Site Services
Date: October 30, 2014
Signature:



DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
01/06/14	0	MA	EM	Use
10/30/14	1	TM	BP	Use

TABLE OF CONTENTS

1 PURPOSE AND SCOPE

The purpose of this procedure is to provide a set of operational requirements for the safe controlled burning of untreated clean wood waste and cardboard in an environmentally-acceptable manner at the Mary River Project. The open burning of untreated wood waste is one of a number of elements of the Mary River Project source segregation and waste management program.

2 REQUIREMENTS

2.1 HAZARDS/ PERSONAL PROTECTIVE EQUIPMENT (PPE)/ SPECIAL EQUIPMENT

2.1.1 HAZARDS

There are numerous specific hazards associated with the management of open burning. They include:

- Puncture or slivers from handling broken wood or wood containing nails & screws
- Smoke inhalation from working in the smoke plume of the fire
- Burns from direct contact with the flames or indirect burns from clothing coming in to contact with flame.
- Burns or fire from handling embers (un-combusted wood) in the ash

2.1.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Wear Standard P.P.E. - Safety glasses, hard hat with reflective tape, safety boots, reflective vest, clothing in good condition, gloves or mitts in good condition
- Do not wear loose flammable clothing such as an unbuttoned work shirt when working around the burn container

2.1.3 SAFETY EQUIPMENT REQUIREMENTS

- Skid Steer/Bob Cat will be used to stockpile the clean wood and cardboard in the burn container
- A spade or shovel should be used to turn over & inspect the residual ash.

2.2 PERMITS/ TRAINING AND/OR QUALIFICATION REQUIREMENTS

Any person who may be burning untreated wood at a Baffinland work site shall complete the documented training in this procedure and demonstrate their understanding of the hazards and controls. Verification of training will be kept by the Training Department.

3 RESPONSIBILITES

The following roles have specific accountabilities that must be met to ensure the **Mine Site Complex (MSC)** and **Port Site Complex (PSC)** clean wood waste open burnings are operated in compliance with this procedure and its permit. The following roles and responsibilities shall be followed to safely and

successfully operate the open burns. Area Superintendents/Supervisors are responsible for ensuring that all personnel are fully trained and competent to meet the expectations of this procedure.

3.1 MSC/PSC Manager or his Designate

The Site Services Manager or designate is accountable for the overall operation of the open burning. Specifically, he or she shall:

Organize, oversee and administer the operation of the burn in accordance with current permits, regulations and this procedure.

Evaluate the burn permit requirements and monitor and direct the wood and cardboard waste open burn activities

3.2 MSC/PSC Site Services Supervisor

The Site Services Supervisor, under general supervision of the Site Services Manager or designate, is responsible for supervising the operation of the open burning in accordance with this procedure. Specifically, the Site Services Supervisor shall:

Supervise the Open Burn Operator in the safe execution of this procedure

Inspect the burn container residual ash to ensure it contains no hot embers prior to transport to the landfill

3.3 Site Services Operator

The Site Services Operator, under the general supervision of the Site Services Supervisor is responsible for executing the following tasks at the burn container. Specifically the Operator shall:

Work in conjunction with the Site Services Supervisor in executing this procedure. Conduct the burn in compliance with this procedure.

Know how to respond appropriately to all emergencies described in this procedure.

Complete report forms as required. The approximate quantity and general types of waste (based on visual estimation of volume to nearest cubic meter) will be noted on a form to be filled out daily whenever open burning occurs. The completed forms are to be submitted to the Environment Department on a monthly basis.

3.4 Environmental Manager or Designate

The Environmental Manager or Designate will issue the approval to open burn (Open Burn Permit) for a specified period and will work with Site Services Manager, Supervisors, and Operators to ensure that the

open burn activities are comply with applicable environmental permits and in accordance with directives provided by responsible regulators and agencies. Environmental monitors, under the direction of the Environmental Manager or Designate will conduct periodic inspections of the designated open burn areas and operations to ensure compliance with permits and this SOP. If environmental non-compliances are identified, the Open Burn Permit can be revoked and a request for specified corrective actions to be implemented. The quantity and types of waste being open burned are summarized and reported in the Annual NWB and QIA Reports submitted by March 31 of each year.

4 DEFINITIONS

MSC: Mine Site Complex

PSC: Port Site Complex

SOP: Standard Operating Procedure

Open Burning: Burning of any material or substance in the ambient air in an open topped burn container.

Permit: A paper or electronic form that documents the approval of open burning at one of the two approved open burn sites. This permit will cover a specified period when open burning would be allowed under the conditions specified in this SOP.

Clean Untreated Wood Waste: Clean untreated wood waste includes wood or timber, not suitable for recycling or reuse that is substantially free of glue, petroleum based materials, other chemicals, or contains other non -wood products

Cardboard, Paper Products and other packaging: Clean paper products and paperboard packing material including boxboard and cardboard, as well as natural fibre textiles (i.e. cotton, wool).

5 PROTOCOL

5.1 Source Segregation And Waste Management Programs

It is Baffinland's policy to minimize material and packaging purchased and shipped to Mary River to reduce the amount of waste produced at the site, reuse and recycle waste, and maximize diversion from the landfill.

The Mary River source separation program consists of a series of ongoing activities to separate reusable and recyclable waste materials from other wastes at the point of origin. The purpose of the source separation program is to separate the waste into its material categories as well as from other wastes so that wastes that can be reused or recycled, are diverted from the landfill. The execution of the source segregation program at the Mary River Project serves to:

- Ensure hazardous material is segregated, packaged and shipped to licensed facilities in the South
- Promote the diversion of waste away from the non-hazardous solid waste landfill
- Direct domestic kitchen, office and camp waste to incinerators
- Reduce, reuse and recycle wood products to the extent practicable
- Divert non-reusable/non-recyclable clean wood waste and cardboard from the non-hazardous solid waste landfill for open burning

5.2 Clean Wood And Cardboard Open Burning Operations

Open burning shall strictly be operated in an open top sea container. This shall help to prevent waste and ash from blowing around and allow easy removal and disposal of ash.

5.2.1 Open Burning Container Locations And Access Control

There are only two approved open burn locations at the Mary River Project. Both sites are signed and as identified at the following locations:

- MSC: N 71° 19' 56.4" W 79° 24' 33.2"
- PSC: N 71° 52' 30.571" W 80° 53' 27.874"

The burn area will be restricted access. Gates must be kept closed and locked when the burn area is not occupied by trained operators. The burn area locations are located a distance greater than 30 metres from any water body and are far enough from camp facilities to prevent impact to personnel from airborne emissions. Signage at gate needs to be in place and maintained to be visible upon approach.

5.2.2 Acceptable Clean Wood Waste

Acceptable clean wood waste **permitted** for open burning includes the following products that are not suitable for re-use or recycling:

- Lumber
- Timber
- Pallets
- Paper products & paperboard packaging

Non-clean wood wastes are **not permitted** for open burning. This includes the following wood products:

- Treated or painted wood
- Plywood
- Petroleum-based materials
- Materials contaminated with petroleum or petroleum derivatives
- Petroleum products used as accelerants
- Plastics, electrical wire, Styrofoam or asbestos

5.2.3 Open Burn Permit

Prior to ignition of the wood pile the Open Burn Operator shall ensure that all conditions of this SOP are met that the Burn Permit for the dedicated burn locations is in good standing.

Open burning shall occur only with a permit that is current and in good standing and that covers the period required. In the event of non-compliance of this SOP or in the event of an environmental or safety infraction, the permit may be revoked for a specified period of time until corrective action is implemented to the satisfaction of the Site Services and Environmental Managers. The Open Burn Permit is provided by the Environmental Manager or his designate and will be valid for a set period of time.

5.2.4 Weather Conditions

Mild to moderate winds provide for the best smoke dispersal. Extreme winds create a potential uncontrollable fire condition. Ignition of waste pile is not permitted in winds greater than 20 km/h

The burn shall be temporarily stopped if the burn has the potential to:

- Create a condition in which a fire hazard is created or a condition in which the open burning can cause a fire to spread beyond its initial area
- Cause air pollution that creates a health hazard, a public nuisance or directly impacts wildlife

To ensure a "hot burn" is maintained to create an efficient burn, start the fire during dry conditions (i.e. Not during wet, rain conditions).

5.2.5 Open Burn Supervision

The designated MSC/PSC Manager is responsible for ensuring the conditions as required by this procedure are complied with.

5.2.6 Burning Guidelines

The wood will be kept as dry as possible before burning.

The primary goal in operating the open burn pit is to maintain a "hot burn" to create an efficient burn. To that end, the burning shall be managed as follows:

- The size of the burn pile will be contained within the container using consistent/constant feed rates to avoid over feeding and damping the fire
- A "hot burn" should be maintained to create an efficient burn using consistent/constant feed rates to avoid over-feeding and damping the fire.
- Construct piles loosely, with spaces to allow adequate oxygen to reach the burning material. Create a "heart" of fine, flammable paper or fine wood waste and light it down low on the side the wind is coming from

- Construct piles in a dome or teepee shape that allows heat to build so that flames can be maintained and the wood can be consumed rapidly. Flat, sprawling piles rarely burn well.
- Make sure your pile is clean, the arch enemy of a good burn pile is dirt
- The Open Burn Operator shall monitor the pile to make sure it burns hot and clean.

5.2.7 Ignition

The only authorized methods for igniting the wood waste in the open burning container are:

- Propane burners provide a safe ignition. All propane bottles are to be stored in the vehicle when not immediately being used for ignition and are to be disposed of in an authorized recycling container for pressurized or hazardous material.
- Paper and matches can be used as a safe method of ignition.

No fuel or other petroleum based product or other chemical is permitted as an accelerant

5.2.8 Extinguishing Requirements

Fires will be extinguished under the following conditions:

- When any condition as required by this procedure is not met.
- To ensure smouldering of material does not persist upon completion of the open burn.

5.2.9 Disposal Of Open Burn Ash

All residual waste and ash will be collected and disposed of in the MSP approved non-hazardous material solid waste landfill or a designated area approved by the Inspector. The following conditions must be met prior loading and transport of the ash to the landfill:

- Upon completion of the open burn and subsequent extinguishing, ash will be allowed to cool for 48 hours.
- Fill shall be mixed with the ash in the burn container to confirm the ash is extinguished and to prevent loss of ash during transport to the landfill.
- ALL ash and debris in the vicinity of the burn container shall be cleaned up prior to subsequent burns.

5.2.10 Open Burn Areas

- The gates which control access to the open burn areas shall remain locked at all times when the area is not in use or is unattended and only authorized personnel shall have access to the area.
- Signage shall be clearly posted at the open burn locations in both English and Inuktituk and shall include but is not limited to the SOP for Open Burning, the general Waste Segregation Guidelines as well as the Waste Segregation Guidelines for Open Burning.

6 REFERENCES AND RECORDS

- Nunavut Mine Health and Safety Act and Regulations
- Canadian Standards Association
- Nunavut Water Board Type A Water Licence No: 2AM-MRY1325
- Commercial Lease No.: Q13C301
- Baffinland Iron Mines Corporation Mary River Project Waste Management Plan for Construction, Operation and
- Closure, dated April 19, 2013
- Waste sorting Guidelines
- Waste Sorting Guidelines – Open Burning
- Form for recording approximate volumes and types of wastes to be open burned.

Appendix I -
Examples of 'Typical' Used Oil Heaters and Boilers

CLEAN BURN
ENERGY SYSTEMS
The World Leader In Used-Oil Heating Systems™

Versatile Hot Water Technology

Used-Oil Coil Tube Boilers

Models CB-200-CTB, CB-350-CTB and CB-500-CTB

Clean Burn offers the industry's only coil tube boilers engineered from the ground up to burn used oils. They efficiently recycle used oils as a free fuel source to generate hot water, and are remarkably versatile for a wide range of applications, such as car wash facilities, baseboard heating, space heating, in-floor heating and ice melt applications.

Only Clean Burn offers three sizes of used-oil coil tube boilers, each UL listed for use in central heating systems. These can be used in combination to create a boiler system perfectly sized for any facility.

As the industry gold standard for robust construction, reliability and long service life, Clean Burn provides a greater return on investment than any other equipment of its kind. And Clean Burn distributors provide unrivaled service and support.

Model CB-500-CTB


Model CB-350-CTB


Model CB-200-CTB

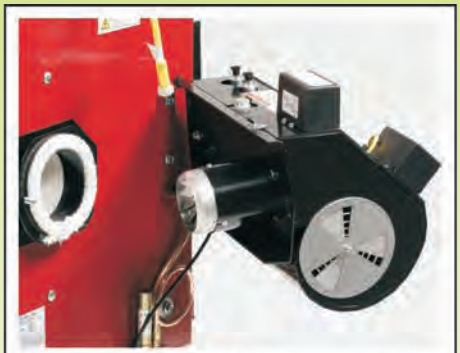
Clean Burn is a strong advocate of environmental protection and energy conservation. Our multi-oil heating systems, storage tanks and recycling centers eliminate extra handling and transportation of used oils and, consequently, help avoid the possibility of used oils entering our water supplies.

ENERGY STAR

The first choice for reliability, economy and return on investment

Easier maintenance

With Clean Burn Coil Tube Boilers, you spend 30 minutes cleaning every 750-1000 hours of operation. With competitive units, you spend 2 hours cleaning every 400 hours of operation.



Patented burner technology

The Clean Burn burner swings out for easy cleaning, maintenance and service. An exclusive heater block, atomizer and combustion mechanism make Clean Burn unmatched for reliability, performance and long service life.

Wired, plumbed for installation

Clean Burn Coil Tube Boilers arrive with wiring and plumbing in place, helping make installation much faster and easier. They meet all national fire and safety codes.

The world's most reliable, most technically advanced used-oil boilers, only from Clean Burn.

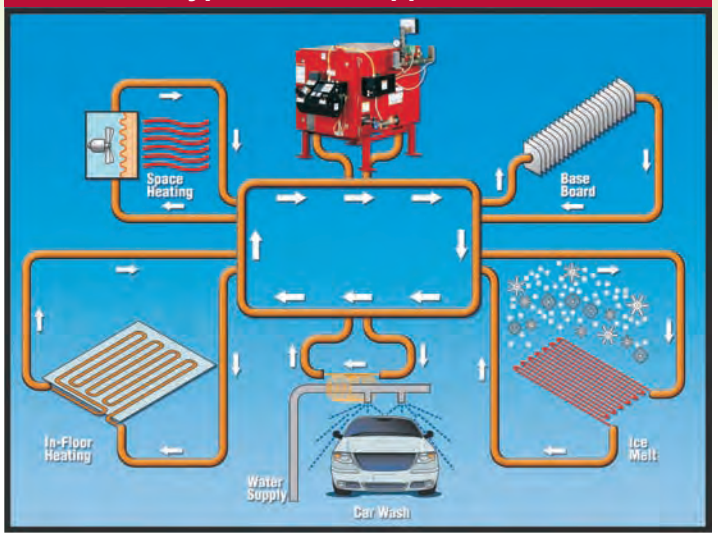
Multiple Clean Burn Boilers can be used to create larger systems.

Clean Burn Coil Tube Boilers are uniquely designed for installation flexibility. Each is engineered for use as a single boiler unit, or as part of a series of boilers working as a larger system.

- Three-pass heat exchanger captures more heat for greater efficiency
- Low-mass water design provides quick start-up and reduces stack heat loss
- Patented burner engineered exclusively for used-oil combustion
- System is pre-plumbed, pre-wired, ready for installation
- Narrow cabinet designs provide installation flexibility

UL listed, ASME tested and approved.

Typical Boiler Applications



Clean Burn used-oil boiler systems are so versatile that they are used for a wide range of applications, from heating water in a car wash to in-floor heating systems and more.

MODEL	CB-200-CTB	CB-350-CTB	CB-500-CTB
BTU/hour input:	200,000 / 58.6 kW	350,000 / 102 kW	500,000 / 146.5 kW
BTU/hour output:	148,500 / 43.5 kW	260,000 /76.2 kW	372,000 /109.0 kW
Fuels: Used oils Fuel oils	Crankcase, ATF and hydraulic #2, #4, #5	Crankcase, ATF and hydraulic #2, #4, #5	Crankcase, ATF and hydraulic #2, #4, #5
Heating surface	39 sq. ft. / 3.6 sqM	68 sq. ft. / 6.3 sqM	97 sq. ft. / 9.0 sqM
Boiler water volume	5 gal. / 19 L	12 gal. / 45.4 L	20.6 gal. / 78 L
Design water flow per coil	15 gpm / 57 lpm	25 gpm / 95 lpm	37 gpm / 140 lpm
Cabinet dimensions	39.5" L x 29" W x 29" H 1003 mm x 737 mm x 737 mm	56" L x 34.25" W x 34.5" H 1422 mm x 870 mm x 876 mm	66.5" L x 39.75" W x 41.75" H 1689 mm x 1009 mm x 1060 mm
Overall dimensions (with burner/breach/plumbing)	57.5" L x 33.25" W x 37" H 1460 mm x 844 mm x 939 mm	74" L x 39.25" W x 41" H 1880 mm x 997 mm x 1041 mm	85.25" L x 43.5" W x 47.85" H 2165 mm x 1105 mm x 1215 mm
Approximate weight	677 lbs. / 304.7 kg	1240 lbs. / 562.4 kg	1600 lbs. / 725.7 kg
Electrical requirements	115 VAC 60 Hz single phase*	115 VAC 60 Hz single phase*	115 VAC 60 Hz single phase*
Maximum oil consumption	1.4 GPH / 5.3 lph	2.5 GPH / 9.5 lph	3.57 GPH / 13.5 lph
Stack size	8" / 203 mm	8" / 203 mm	10" / 254 mm
Air compressor req's	2.0 CFM @ 25 PSI 3.4 m^3/h @ 1.7 bar	2.5 CFM @ 25 PSI 4.25 m^3/h @ 1.7 bar	2.5 CFM @ 25 PSI 4.25 m^3/h @ 1.7 bar
Recommended clean-out	750 hours	1000 hours	1000 hours

*230V / 50 Hz units also available

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The #1 Waste Oil Furnace In Customer Satisfaction™

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Lancaster, PA USA 17601
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