APPENDIX 28-3. INCINERATOR MANAGEMENT PLAN

AGNICO EAGLE

MELIADINE GOLD MINE

Incineration Management Plan

MARCH 2024
VERSION 8
6513-MPS-01

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is operating the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine Plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Incineration Management Plan for the Mine, prepared in accordance with best management practices, Environment and Climate Change Canada's *Technical Document for Batch Waste Incineration,* and guidelines issued by the Nunavut Impact Review Board for the Mine.

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Performance limits for the incinerator at the Mine will be in accordance with the emission guidelines set out by the Canadian Council of Ministers of the Environment. Ash produced from the incineration process will be disposed of in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges*.

The Mine is operating its incinerators based on Environment and Climate Change Canada (ECCC)'s *Technical Document for Batch Waste Incineration*. In addition to incinerator technology, the implementation of a waste segregation program is limiting emissions (e.g., dioxins and furans, mercury) from the incinerators.

Two incinerators are used at the Meliadine Mine. The primary incinerator is a typical modern controlled-air, batch, dual chamber incinerator model - ECO 1.75TN 1PVC100L 16-1MS. The secondary incinerator is dual-chamber system that operates under starved -air conditions KETEK CY-100-CA-D incinerator.

Monitoring and testing are conducted for incinerator stack emissions and incinerator ash. Results are part of the Annual Report for the Mine. Agnico Eagle also reports emissions to the environment through ECCC's National Pollutant Release Inventory (NPRI) and Greenhouse Gas Reporting Program (GHGRP).

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ᐊᒃᓂᖁ ᐃᒧ ᐅᔭᕋᒃᑕᕆᐊᓕᕆᔩᒃᑯᑦ (ᐊᒃᓂᖁᒃᑯᑦ) ᐊᐅᓛᖅᑎᑦᑎᔪᖅ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒍᓗᒧᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ (ᐅᔭᕋᒃᑕᕆᐊᖅ), 25 ᑭᓛᒥᑖᓗᐊᓂᒃ ᐅᙵᓯᒃᑎᒋᔪᖅ ᐅᐊᖕᓇᙵᓂᑦ ᑲᖏᖅᖠᓂᐅᑉ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑖᓗᐊᓂᒃ ᐅᙵᓯᒃᑎᒋᔪᖅ ᓂᒋᖅᐸᓯᐊᓂᑦ/ᐱᙵᖕᓇᖅᐸᓯᐊᓂᑦ ᐃᒃᓗᓕᓛᕐᔪᖕᒥᑦ ᑭᕙᓖᕐᒥᑦ ᓄᓇᕘᒻᒥᑦ. ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎ ᐅᔭᕋᒃᑖᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖃᕈᒪᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᒥᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐱᕗᓕᐊᓗᒍ ᑎᕆᒐᓂᐊᖅ ᒍᓗᑕᓕᒃ, ᒪᕐᕉᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᓂᑦ (ᑎᕆᒐᓂᐊᖅ 1 ᐊᒻᒪᓗ ᑎᕆᒐᓂᐊᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑖᕐᓂᖅ.

ᑎᑎᖅᑲᖅ ᑐᓂᓯᔪᖅ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᖕᒥᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ, ᐱᓕᕆᐊᖑᔪᖅ ᒪᓕᒡᒋᑦ ᐱᐅᓛᒃᑯᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ, ᑲᓇᑕᒥᑦ ᐊᕙᑎᓕᕆᔩᒃᑯᑦ ᐊᒻᒪᓗ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᔪᓕᕆᔩᒃᑯᑦ ᑎᑎᖅᑲᐅᑎᙵᑦ *ᐱᓕᕆᐊᕐᒧᑦ ᑎᑎᖅᑲᐅᑎ ᑲᑎᓯᒪᔪᑦ ᐊᒃᑕᑰᖅᑕᐅᔪᑦ ᐃᑯᐊᓪᓚᒃᑎᑕᐅᔪᓄᑦ*, ᐊᒻᒪᓗ ᒪᓕᒃᑕᐅᔪᒃᓴᐃᑦ ᑐᓂᔭᐅᔪᑦ ᐊᕙᑎᓕᕆᔩᒃᑯᓐᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ.

ᓯᑎᔪᓂᒃ ᐊᒃᑕᑰᖅᑕᐅᔪᓂᒃ ᐃᑯᐊᓪᓚᒃᑎᓇᕝᕖᑦ ᐊᒻᒪᓗ ᐊᒃᑕᑰᖅᑕᐅᔪᓂᒃ ᐅᖅᓯᐊᓗᙵᑦ ᐃᑯᐊᓪᓚᒃᑎᕈᕖᑦ ᐊᐅᓚᑕᐅᔪᑦ ᓄᓇᕗᒻᒥ ᒪᓕᒃᑯᒋᑦ *ᓄᓇᕗᒻᒥᑦ ᐃᓄᓗᒃᑖᓂᒃ ᐋᓂᐊᖃᖅᑕᐃᓕᒪᔪᓕᕆᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ, ᓄᓇᕗᒻᒥ ᐊᕙᑎᒥᒃ ᒥᐊᓂᖅᓯᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ, ᐊᒻᒪᓗ ᒐᕙᒪᒃᑯᒃᑯᑦ ᐊᕙᑎᒥᒃ ᒥᐊᓂᖅᓯᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ*. ᖃᓄᐃᓕᐅᕐᓂᕐᒧᑦ ᑭᒡᓕᐅᔪᑦ ᐃᑯᐊᓪᓚᒃᑎᕈᑎᒧᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᒪᓕᒃᑐᖅ ᐊᓂᐊᔪᓄᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᓂᒃ ᐋᖅᑭᑕᐅᓯᒪᔪᑦ ᑲᓇᑕᒥᑦ ᑲᑎᒪᔩᑦ ᒥᓂᔅᑕᐅᑎᓄᑦ ᐊᕙᑎᒥᑦ. ᐊᕐᔭᓕᐅᖅᑕᐅᔪᑦ ᐃᑯᐊᓛᖅᑎᑦᑎᓂᕐᓂᑦ ᐃᒋᑕᐅᓂᐊᖅᑐᑦ ᒪᓕᒡᓗᒋᑦ *ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᖅ ᐱᓕᕆᕝᕕᒃᔪᐊᕐᒥᑦ ᐊᒃᑕᑰᖅᑕᐅᔪᓄᑦ*.

ᐅᔭᕋᒃᑕᕆᐊᖅ ᐊᐅᓛᖅᑎᑕᙵᑦ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᒃ ᐊᑐᖅᑐᕆᑦ ᑲᓇᑕᒥᑦ ᐊᕙᑎᓕᕆᔩᒃᑯᑦ ᐊᒻᒪᓗ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᔪᓕᕆᔩᒃᑯᑦ *ᐱᓕᕆᐊᕐᒧᑦ ᑎᑎᖅᑲᐅᑎ ᑲᑎᓯᒪᔪᑦ ᐊᒃᑕᑰᖅᑕᐅᔪᑦ ᐃᑯᐊᓪᓚᒃᑎᑕᐅᔪᓄᑦ*. ᐃᓚᒋᔭᐅᑉᓗᓂ ᐃᑯᐊᓪᓚᒃᑎᕈᑎᒧᑦ, ᐊᑐᓕᖅᑎᑕᐅᓂᖓ ᐊᒃᑕᑯᓂᒃ ᐊᑎᕆᓃᑦ ᑭᒡᓕᖅᑲᖅᑎᑦᑎᔪᖅ ᐊᓂᐊᔪᓂᑦ (ᓲᕐᓗ, ᑕᐃᐋᒃᓯᓐ (dioxins) ᐊᒻᒪᓗ ᕘᕚᓐ (furans), ᓱᖑᓯᐃᑦᑐᖅ (mercury) ᐃᑯᐊᓪᓚᒃᑎᕆᑎᒥᙵᖅᑐᓂᒃ.

ᒪᕐᕉᒃ ᐃᑯᐊᓪᓚᒃᑎᑎᕝᕖᑦ ᐊᑐᖅᑕᐅᔪᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ. ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᓪᓗᐊᖑᔪᖅ ᐊᐅᓚᑕᐅᖃᑦᑕᖅᑐᖅ ᐊᓂᖅᓵᖅᑐᖅᑕᑉᑎᖕᓄᑦ, ᑲᑎᒪᔪᓄᑦ, ᒪᕐᕉᖕᓂᒃ ᑐᖅᓱᐊᕆᒃ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᒃ ᐅᓇᐅᑉᓗᓂ - ECO 1.75TN 1PVC100L 16-1MS. ᑐᒃᑭᐊ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᒃ ᒪᕐᕉᖕᓂᒃ ᑐᖅᓱᐊᕆᒃ ᐊᐅᓛᖃᑦᑕᖅᑐᖅ ᐊᓂᖅᓵᖅᑐᖅᑕᑉᑎᖕᓂᑦ ᐱᑕᖃᕐᙳᖅᓯᓂᒃᑯᑦ KETEK CY-100-CA-D ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᒃ.

ᖃᐅᔨᓴᖅᑕᐅᓚᐊᖅᑐᖅ ᐊᒻᒪᓗ ᐆᒃᑐᕋᖅᑕᐅᑉᓗᓂ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᐅᑉ ᑐᖅᓱᐊᙵᓂᑦ ᐊᓂᐊᔪᑦ ᐊᒻᒪᓗ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᕝᕕᖕᒥᑦ ᐊᕐᔭᐃᑦ. ᖃᓄᐃᙵᓂᐅᔪᑦ ᐃᓚᒋᔭᐅᔪᑦ ᐊᕐᕋᒍᑕᓖᖅᓯᐅᑎ ᐅᓂᑉᑳᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ. ᐊᒃᓂᖁᒃᑯᑦ ᐅᖃᐅᓯᕆᓚᐅᕐᒥᔭᖏᑦ ᐊᓂᐊᔪᑦ ᐊᕙᑎᒧᑦ ᑲᓇᑕᒥᑦ ᐊᕙᑎᓕᕆᔩᒃᑯᑦ ᐊᒻᒪᓗ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᔪᓕᕆᔩᒃᑯᑦ ᑲᓇᑕᒥᑦ ᐱᑦᑕᐅᖏᑦᑐᓂᒃ ᓴᐳᑦᑕᐅᔪᓂᒃ ᓈᓴᖅᑕᐅᔪᓄᑦ ᐊᒻᒪᓗ ᐱᑦᑕᐅᖏᑦᑐᑦ ᐊᓂᐊᔪᓂᒃ ᐅᖃᐅᓯᕆᔭᐅᓂᖏᓐᓄᑦ ᑐᕋᖕᖓᔪᒧᑦ.

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TABLES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Incineration Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	7.4.2	15	Revision made to address review comments and commitments	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			First version of Supporting Documents for Type A Water Licence Application, submitted to Nunavut Water Board for review	John Witteman, Env. Consultant, Agnico Eagle
5	February 2018			Reviewed internally	Agnico Eagle Environment Dept.
6	February 2019			Reviewed internally (added changes that the construction phase brought and review of the grammatical tense)	Agnico Eagle Environment Dept.
7	February 2022	All		General Update	Agnico Eagle Environment Department
8	March 2024	All 1.4, 4.1, 5, 6.4.1, 6.5		General Update Addition of information related to Secondary Incinerator	Agnico Eagle Environment Department

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CWS	Canada-Wide Standards
ECCC	Environment and Climate Change Canada
GHGRP	Greenhouse Gas Reporting Program
GN	Government of Nunavut
IMP	Incineration Management Plan
IOL	Inuit Owned Lands
KivIA	Kivalliq Inuit Association
Mine	Meliadine Gold Mine
NIRB	Nunavut Impact Review Board
NPRI	National Pollutant Release Inventory
NWB	Nunavut Water Board

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is operating the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, Nunavut, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut

The Mine Plan includes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

Mining facilities on surface include a plant site and accommodation buildings, ore stockpiles, a tailings storage facility (TSF), two waste rock storage facilities (WRSFs), a water management system that includes collection ponds, water diversion channels, retention dikes/berms, and water treatment plants.

This document presents an updated version of the Incineration Management Plan (Plan).

The purpose of the Plan is to provide consolidated information on the specifications, operations, management, monitoring, and reporting of the incinerator process for the Mine. This Plan will be reviewed and updated on a regular basis to reflect changes to the Mine.

1.1 Concordance

This Plan has been developed to be consistent with the guidance provided in the Environment and Climate Change Canada's (ECCC) Technical Document for Batch Waste Incineration (EC, 2018).

1.2 Related documents

Related documents include the following:

- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan; and
- Interim Closure and Reclamation Plan; and
- Occupational Health and Safety Plan.

1.3 Objectives

At the Mine site, all wastes are safely managed from the time they are produced to their final disposal. All wastes are segregated at the mine site and are predominately landfilled, incinerated, or recycled. Remaining wastes, including hazardous waste[1], are packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

[1] Please refer to the Hazardous Materials Management Plan for further information on the handling and management of hazardous waste.

Incineration is an essential part of waste management at the mine site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunchrooms, shops, warehouses, and offices diverts waste from directly reporting to the on-site landfill. It has the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

The objectives of this Plan are summarized as follows:

1) To understand the quantity and composition of the waste generated at the mine site, and separate waste acceptable for incineration from waste that is not;
2) To operate the batch waste incinerators based on the characteristics and quantity of waste, and to locate them in appropriate buildings away from other site infrastructure;
3) To properly maintain the incinerators' functionality;
4) To operate the incinerators for optimal combustion, and avoid the formation of dioxins and furans in the combustion process;
5) To safely handle and dispose of incinerator residues; and
6) To establish a record keeping system for managing the facility and for future reporting.

As a component of the Mine Environmental Management System, the Plan will be updated to ensure that site experience is reflected in the Plan and subsequently communicated to all parties. The Mine Environment Superintendent or designate is responsible for managing and implementing the Incineration Management Plan.

1.4 Incinerators Location

The incinerators are located on the south end of the industrial pad. The primary and secondary incinerators are located next to each other, as shown in Figure 1 below.

Figure 1: Location of the primary and secondary incinerators at the Meliadine Mine

SECTION 2 • REGULATORY SETTING

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Various regulations and guidelines under these Acts, as well as guidelines developed by the Canada Council of Ministers of the Environment (CCME), were reviewed in preparing the Plan. They are as follows:

- *Canadian Environmental Protection Act* (CEPA)
    - Schedule 1: List of Toxic Substances
    - *Interprovincial Movement of Hazardous Waste Regulations*
    - *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*
- ECCC Technical Document for Batch Waste Incineration (EC, 2018)
- Canada-Wide Standard for Dioxins and Furans (CCME, 2001a)
- Canada-Wide Standard for Mercury (CCME, 2000)
- Northwest Territories *Environmental Protection Act*
    - *Used Oil and Waste Fuel Management Regulations*
- Nunavut *Environmental Protection Act*
    - Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN, 2011b)
    - Environmental Guideline for the Burning and Incineration of Solid Waste (GN, 2012)
    - Environmental Guideline for Ambient Air Quality (GN, 2011)
    - Environmental Guideline for Mercury-Containing Products and Waste Mercury (GN, 2010)
- Nunavut *Public Health Act*

Performance limits for the incinerator at the Mine will be in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans (CCME, 2001a), and Canada-Wide Standards for Mercury Emissions (CCME 2000). The CCME Guidelines for dioxins and furans and mercury emissions were adopted by the GN Department of Environment in their Environmental Guideline for the Burning and Incineration of Solid Waste (GN 2012).

The management of used oil is regulated in the Northwest Territories through the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012; Reg. 064-2003). In the absence of Nunavut guidelines/regulations pertaining to used oil and waste fuel, the Northwest Territories regulations will be followed for the Mine.

Ash produced from the incineration process will be disposed of in accordance with the Nunavut Environmental Guideline for Industrial Waste Discharges (GN, 2014).

SECTION 3 • BACKGROUND INFORMATION

3.1 Dioxins and Furans

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, commonly known as dioxins and furans, are toxic, persistent, and bioaccumulative chemicals. Their presence in the environment results predominantly from human activity. The biggest source of dioxins and furans in Canada is the large-scale burning of municipal and medical waste. Other major sources include:

- the production of iron and steel;
- backyard burning of household waste, especially plastics;
- fuel burning, including diesel fuel and fuel for agricultural purposes and home heating;
- wood burning, especially if the wood has been chemically treated;
- electrical power generation; and
- tobacco smoke.

Due to their environmental persistence and ability to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the CEPA, the Environment Canada Toxic Substances Management Policy (EC, 2004) and the CCME *Policy Statement for the Management of Toxic Substances* (CCME, 1998).

3.2 Mercury

Mercury is a naturally occurring substance, which can be transformed through biological processes to methyl mercury, a persistent substance which bioaccumulates in the food chain and is particularly toxic to humans and wildlife. Mercury contamination originates from natural and anthropogenic sources, the latter including combustion of waste. Under a variety of regional, national, bi-national, and internal programs, treaties and agreements, mercury is being targeted for emissions reductions consistent with the CCME *Policy Statement for the Management of Toxic Substances* (CCME, 1998), which identifies that mercury shall be managed through its lifecycle to minimize release.

3.3 Used Oil and Waste Fuel

The following definitions are provided in the *Used Oil and Waste Fuel Management Regulations*.

Used Oil: Any oil, including lubrication oil, hydraulic fluids, metal working fluid, and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water, or waste from a petroleum refining operation.

Waste Fuel: A flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha, and fuel oil, but does not include paint, solvent, or propane.

SECTION 4 • PERFORMANCE LIMITS

4.1 Incinerators Selection

The Mine selected its incinerators based on Environment and Climate Change Canada's *Technical Document for Batch Waste Incineration*. The primary incinerator for the Mine is a camp waste incinerator (model no. ECO 1.75TN 1PVC100L 16-1MS) from Eco-Waste Solutions. The secondary incinerator is a KETEK CY -1 00 -C A -D incinerator dual-chamber system that operates under starved-air conditions. The incinerators comply with the guidelines listed in Table 4-1, where the maximum emissions are expressed as a concentration in the exhaust gas exiting the facility's stack. The specifications of the primary and secondary incinerators are available in Appendix A and B, respectively. In addition to incinerator technology, the implementation of a waste segregation program limits emissions of dioxins and furans, and mercury from the incinerator.

Table 4-1 Emission Regulations for Solid Waste Incinerators

Emissions	Sector	Guideline (max)[a]	Units	Reference
Dioxins and Furans	Municipal Solid Waste[b]	80	pg I-TEQ/Rm^3	CCME 2001a
Mercury	Municipal Waste	20	µg/Rm^3	CCME 2000

[a] Stack concentrations are corrected for 11% oxygen.

[b] According to the Canada-Wide Standards (CWS), "municipal solid waste" includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e., non-hazardous wastes regardless of origin), but does not include "clean" wood waste.

Compliance to these performance limits is confirmed with annual stack testing.

4.2 Used Oil and Waste Fuel

Agnico Eagle will manage used oil and waste fuel according to the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012) as presented in Table 4-2.

Table 4-2 Summary of Used Oil and Waste Fuel Regulations

Activity	Summary of Regulations
Registration	• Waste oil burner shall be registered with the Chief Environmental Protection Officer.
Disposal	• Used oil/waste fuel will not be disposed of directly into the environment.
Storage	• Used oil/waste fuel will be stored in specifically designed container for hydrocarbons to minimize the risk of spills; • Used oil/waste fuel containers will be periodically inspected for leaks or potential leaks; and • Used oil/waste fuel will be stored as per the Hazardous Materials Management Plan.

Sampling and Analysis	• A sample of one month's feedstock of used oil/waste fuel is required to be tested at least once a year;
	• Used oil/waste fuel will be tested for:
	  • Flash point; and
	  • Existence and amount of each impurity Listed in Table 5-3.

Burning	• Used oil/waste fuel will not be openly burned; • Used oil will not be burned in accommodation areas; • Used oil with a flash point of less than 37.7°C will not be burned or blended with another used oil/waste fuel; • Used oil that exceeds guidelines will not be burned; and • A 14-day notice will be given for the burning of waste fuel.

Records	• The following will be recorded in association with the incineration of used oil/waste fuel:
	  • Volume of used oil/waste fuel generated;
	  • Volume of used oil/waste fuel incinerated/consumed;
	  • Name and address of person in charge, management or control of the used oil;
	  • Location of production of used oil/waste fuel;
	  • A summary of maintenance performed on used oil/waste fuel burners or processing equipment; and
	  • Volume and nature of the products produced from the used oil.

Table 4-3 summarizes the maximum level of contaminants in used oil that can be incinerated as stipulated in the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012). Under the regulations blending of used oil that exceeds one of more of the criteria listed in Table 4-3 is not allowed.

Table 4-3 Used Oil Impurity Limit

Impurity	Maximum Level Allowed in Used Oil (ppm)
Cadmium	2
Chromium	10
Lead	100
Total Organic Halogens (as Chlorine)	1,000
Polychlorinated Biphenyls	2

4.3 Incinerator Ash

Provided the materials that go into the incinerators are controlled to exclude all hazardous materials, the incinerator ash should be non-hazardous. Even small quantities of hazardous waste, such as batteries, should not be mixed with waste to be incinerated. The purpose of sampling ash is to determine its acceptability for disposal in the landfill, pursuant to the GN Environmental Guidelines for Industrial Discharge (GN, 2011b). No sampling frequency is specified in those guidelines. To ensure compliance with the Guideline parameters, ash will be sampled quarterly by Agnico Eagle. Should an exceedance be measured, an investigation will be undertaken to identify the cause and eliminate the source for this exceedance. Agnico Eagle may increase the testing frequency of the ash following the exceedance. If deemed necessary, the ash will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal.

SECTION 5 • INCINERATOR SPECIFICATIONS AND OPERATION

The Mine has selected a dual chamber, high-temperature incinerator as the primary incinerator and dual-chamber system that operates under starved-air conditions as the secondary incinerator. The technical specifications are included in Appendix A and B. The primary incinerator is housed inside a building with sufficient floor space to manage all Mine wastes in one convenient location.

On August 17, 2023, a design report was submitted to the NWB for the Secondary Incinerator design report and drawings. The design report was approved by the NWB on September 26, 2023. The secondary incinerator will be housed within its own building, next to the primary incinerator building.

5.1 Incinerator Specifications

Primary Incinerator

Typical modern, controlled-air, batch, dual chamber incinerators are designed using the principles of pyrolysis (starved-air burning condition) in the primary chamber and complete oxidation (high temperature, excess oxygen, and sufficient combustion time) in the secondary chamber. The incineration system is a two-stage process. In the first stage, waste is converted to gas in the primary chamber at approximately 650 to 850 degrees Celsius (°C). This process is self fueling until the volume is reduced by 90 %. Gasses from the primary chamber enter the secondary chamber of oxygen-rich and turbulent conditions, which is typically at a higher temperature – around 1,000°C. Combustion is complete after a retention time of about two seconds. The temperature of combustion gases exiting the stack is anticipated to exceed 700°C and to flash cool in the ambient air, thereby leaving little opportunity for the *de novo* synthesis of dioxins/furans. Heat capture is not used on the exhaust gases.

Critical process parameters, such as temperature, air flow, and burner output is computer-controlled to maintain optimal combustion conditions.

For an incinerator capacity suitable for the predicted volumes of waste to be generated at the Mine, the total particulate matter generated is expected to be extremely low. Therefore, dust collection technologies, such as baghouse filters, will not be necessary, as very minor amount of fly ash will be generated. Ash residues generated in the primary chamber are manually removed on a daily basis using a shovel emptied into a metal bin.

Secondary Incinerator

The primary chamber is the first stage of the incinerator where two (2) Becket 2X WIC -2 01 7 70,000 BTU/hr. diesel fired burners are used to increase the temperature of the chamber to ensure that the waste will ignite. To save fuel and reduce pollutants, the burn process becomes self fueling once the chamber reaches the appropriate temperature. This chamber is insulated and has the appropriate refractory to retain the required heat inside the chamber. The primary and secondary chambers are connected by a flame -port. Combustion air is delivered to the secondary chamber through the flame

-port using a blower. The secondary chamber is the second stage of the incinerator where one (1) Becket WIC -3 01 1,600,00 B TU/hr. diesel fired burner is used to maintain the high temperature required to keep the waste ignited and maintain turbulence from the delivery of oxygen by the blower which ensures no black smoke is generated from the system.

The burner controls include a thermostat, relay protection, the option for limited recycle, limited reset, three (3) status lights, valve-o n delay/motor -off delay signals, 15 -second lockout time option, interrupted and intermittent duty ignition, technician pump priming mode, disable function and a communication port.

Additional information can be found in the Meliadine Secondary Incinerator Design Report and Drawings (Agnico Eagle 2023).

5.1.1 Operation Procedures

General operating procedures for the incinerators include:

1. Sort the waste on the basis of origin and heating value. Food waste and waste that has been in contact with food will have priority for incineration.
2. Mix the waste to ensure a calorific value within the incinerator's specification and to achieve good combustion inside the primary chamber.
3. Observe the start of the burn cycle to ensure the incinerator is operating correctly.
4. The door to the incinerator is only opened after the burn cycle is complete and the unit cooled.
5. The ash is removed from the incinerator before it is charged with the next load of waste to be incinerated.
6. The ash is placed in bins digitated for ash.
7. The ash is disposed of in the on-site landfill. If the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN, 2014), ash will be either packaged and sent to an approved disposal facility or buried in the dry stack tailings.

The system has a sizable front door for easy access to manually load/feed waste into the unit with a front-end loader. The proposed waste streams are layered wherever possible during loading to ensure proper combustion.

5.1.2 Emissions

Incinerators are designed to meet performance limits described in Section 4.1. Good engineering practices will be used to ensure required incineration temperatures and dispersion of gases meet applicable air quality standards/guidelines.

The incinerators stack design incorporates appropriate sampling ports, with caps where necessary, at appropriate locations to allow for stack testing to be undertaken during incinerator operation.

5.1.3 Dust/Odour Control Measures

Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and/or odour control measures is not anticipated. Organic/putrescible wastes will be given incineration priority to limit odours.

5.1.4 Staffing and Equipment

The computerized incinerator typically requires one operator to interact with the equipment for approximately 1 to 3 hours per day, largely for ash removal, loading, and start-up. Operators are not typically required to be in attendance during the rest of the operation, as it is normally a fully automated process.

The Ecowaste (primary) incinerator is designed, installed, and operated so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle. Also, the waste is not allowed to combust until the chamber is sealed thus isolating the worker from smoke and high temperatures.

The Ketek (secondary) incinerator can be loaded before burn cycle on startup but also during its burn cycle. Ashes are removed after cool down cycle for the safety of the operator and the proper burn of the waste. A protection barricade prevent operator from risk while stirring the ashes.

5.1.5 Inspections

Weekly inspections will be undertaken of the incinerator buildings for cleanliness and the proper management of wastes delivered to the facility. The Environment Department will carry out the inspections. Weekly preventive maintenance is done including the review of the incinerators' operating parameters to ensure effective operation.

5.2 Used Oil and Waste Fuel

The incinerator is able to efficiently burn used oil and waste fuel. A quantity of about 365,000 litres of used oil and waste fuel may be incinerated per year. The quantity of waste fuel is expected to be small and will be dependent on the adherence to standard operating procedures. The goal is to avoid practices that could result in waste fuel. The principal sources of the used oil will be from oil changes on the mining equipment and light vehicles, as well as oil changes to mechanical gearboxes within the mill. Typical used oil and waste fuel furnaces include a storage tank and a filter to recover sludge prior to burning. Sludge collected in the filters will be drummed and shipped, as needed, to a certified waste management facility for treatment, recycling, and/or disposal.

5.3 Shipboard Incinerator

See Section 8 of the Shipping Management Plan.

5.4 Closure Plan

In accordance with the Interim Closure and Reclamation Plan, salvageable buildings and surface structures, including the incinerators and waste management buildings, will be dismantled and demobilized from the site.

SECTION 6 • WASTE MANAGEMENT

One method of waste reduction is by implementing purchasing policies that focus on reduced packaging. Reduce, reuse, and recycle initiatives as well as the waste segregation program at the Mine as per the Landfill and Waste Management Plan minimizes the quantity of waste incinerated or directed to the landfill.

6.1 Approach

A waste segregation program is implemented at the site. This allows materials that are unsuitable for incineration to be either landfilled on-site or shipped off-site to a certified waste management facility for treatment, recycling, and/or disposal.

6.2 Acceptable Waste for Incineration

Acceptable wastes for incineration will include the following:

- organic matter including food;
- food containers and wrappings, including plastics that are contaminated by food;
- medical waste from the Health Care Station;
- paper, cardboard, and the like;
- hydrocarbon spill absorbents;
- plastic and Styrofoam except plastic containing chlorine;
- dead animals.

6.3 Unacceptable Waste for Incineration

Materials that are not listed above would be unacceptable for incineration. These materials include, but are not limited to:

- chlorinated plastics;
- inert materials, such as concrete, bricks, ceramics, ash, asbestos, drywall;
- bulky materials such as machinery parts or large metal goods such as appliances;
- radioactive materials, such as smoke detectors and laboratory wastes;
- potentially explosive materials, such as propane tanks, other pressurized vessels, unused or ineffective explosives;
- hazardous materials such as organic chemicals (pesticides), other toxic substances (arsenic, cyanide);
- electronics;
- batteries;
- vehicles and machinery;
- fluorescent light bulbs;
- whole tires;

- paint and solvents;
- any materials containing mercury, lead, and cadmium;
- used oil or waste fuel that exceeds the maximum impurity limits for parameters listed in Table 5-3;
- waste oil and waste fuel with a flash point of less than 37.7°C; and
- propane.

6.4 Waste Volumes

6.4.1 Solid Waste and Incinerator Ash

The number of people working on-site and the activities occurring at the time have a direct bearing on the volume of waste destined for the landfill, the incinerator, and the amount removed from waste streams for reuse and recycling.

It has been assumed that each person will produce 1 tonne of refuse per year[2]. Mean camp populations of approximately 200 during construction, 680 during operation, and 50 during closure have been estimated. Fifty percent of the refuse by weight can be incinerated, approximately 30% of incinerated material by mass is converted into ash, thereby reducing the mass of waste by approximately 70 %. In April 2023, a temporary camp capacity increase notification was provided to the NWB, to inform them of Agnico Eagle's intent to temporarily increase site capacity to 822 rooms. The need for this increase in site capacity was from a combination of factors, including construction projects on site.

Thus for 680 to 822 workers, the annual quantity of ash during 8 years of operations would be about 102 to 123 tonnes. Table 7-1 estimates the annual tonnes of ash resulting from incineration for each project phase, based on the number of people on site, and cumulatively over the life of mine.

Table 7-1 Estimation of Ash over the Life of the Mine

Project Phase	Workers On-Site	Annual Tonnes of Waste Incinerated	Annual Tonnes of Ash	Numbers of Years	Cumulative Tonnes of Ash
Construction	200	100	30	4	120
Operation	680-822	340-411	102-123	8	816-984
Closure	50	25	7.5	3	22.5
Total					**958.5-1126.5**

[2] Environment and Climate Change Canada's "State of the Environment InfoBase", Environmental Indicator Series 2003 (http://www.ec.gc.ca), indicates that the per capita non-hazardous solid waste generation in 2000 for Canada was almost 1 tonne per person per year.

6.4.2 Used Oil and Waste Fuel

Approximately 365,000 litres of used oil is anticipated to be used in the primary incinerator for burning the waste. This is based on the maximum capacity of the incinerator burn rate which is approximately 1000 litres/day. The quantity of waste fuel is expected to be small but may vary between years.

6.5 Waste Incineration Rate

The primary incinerator has an approximate incineration capacity of 1,560 kilogram per day. These wastes will primarily associate with food and small amount of medical waste.

The secondary incinerator contributes to Meliadine's overall waste management strategy by maintaining continuity of the waste burns when there is maintenance work being conducted on the site's primary incinerator and also by providing additional capacity of waste material that can be burnt, reducing the likelihood of incinerable waste backlog.

SECTION 7 • MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

7.1 Incinerator Emissions Testing

The incinerators stack design incorporates appropriate sampling ports at appropriate locations, in a right-angle configuration, to allow for stack testing to be undertaken during incinerator operation. Table 8-1 summarizes the frequency of testing that will be completed as per relevant guidelines (see also CCME, 2001b).

Table 7-1 Summary of Incinerator Emissions Testing

	Frequency	Number of Test Required	Reference
Dioxins and Furans	Annual	3	CCME 2001a
Mercury	Annual	3	CCME 2000

7.2 Used Oil/Waste Fuel Testing

A sample of used oil/waste fuel feedstock will be collected each month with one of the monthly samples being tested each year. Used oil/waste fuel not meeting impurity limits or having a flash point less than 37.7°C will be drummed and shipped to a certified management facility for re-refining, treatment, recycling, and/or disposal.

7.3 Ash Testing

An ash testing protocol is implemented on site to ensure that the incinerator ash is suitable for disposal in the landfill. Ash is disposed of and then covered immediately to prevent mobilization.

Ash samples are collected and tested quarterly and compared to the regulatory requirements as outlined in Table 8-2.

If monitoring indicates the ash is above the guidelines and not suitable for landfilling, an investigation will be undertaken to identify the cause and eliminate the source for the exceedance. If deemed necessary, the ash will be packaged in drums and sent to a certified waste management facility for treatment, recycling, and/or disposal.

Table 7-2 Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

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

SECTION 8 • REPORTING

As part of the annual reporting, results from periodic stack emissions and ash monitoring, will be provided.

8.1 National Pollutant Release Inventory (NPRI)

The National Pollutant Release Inventory (NPRI) is a Canadian database containing information on the annual on-site release of specific substances to the air, water, and land from industrial and institutional sources (EC, 2012). The NPRI provides a list of tracked substances and requirements for reporting incinerator emissions. In addition, there are certain substances, that may require reporting depending on the quantity of incinerator emissions. Whether or not reporting is necessary will depend on results of periodic stack emission testing data and the quantity of annual emission calculated with emissions factors.

Agnico Eagle Meliadine reports emissions to the NPRI program every year as required.

8.2 Greenhouse Gas Emissions

Agnico Eagle is committed to annually reporting greenhouse gas emissions in support of Canada's Greenhouse Gas Reporting Program (GHGRP).

SECTION 9 • PLAN REVIEW AND ADAPTIVE MANAGEMENT

The Plan is updated regularly to reflect the operating conditions at the Mine during construction, operation, and closure. The Plan is reviewed annually, and an updated version will be produced as needed.

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APPENDIX A • TECHNICAL SPECIFICATIONS OF THE PRIMARY INCINERATOR

ECO WASTE SOLUTIONS

Meliadine Incinerator
ECO 1.75TN 1PVC100L
16-1MS

CORPORATE OFFICE

Corporate Office:

Eco Waste Solutions

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Burlington, ON, Canada L7L 6E9

Tel: 905-634-7022 Fax: 905-634-0831

Email: info@ecosolutions.com

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Corporate Head Office

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E-Mail	info@ecosolutions.com
Ask for/Address to	Customer Service Manager
Reference	ECO 1.75TN 1PVC100L

ECO WASTE SOLUTIONS

Table of Contents

SECTION 1

HEALTH & SAFETY PRECAUTIONS

Health and Safety Precautions

This machine has a number of energy sources:

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

- **THE INCINERATOR HAS THE POWER TO CAUSE SERIOUS INJURY OR DEATH**
- **KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES**
- **BEFORE STARTING THE CYCLE ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE INCINERATOR**
- **DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD**.
- **RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED RESTS SOLELY ON THOSE OPERATING IT.**

OBEY THE FOLLOWING SAFETY INSTRUCTIONS:

A qualified person is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work.

1. Keep the electrical panel doors closed at all times except when doing electrical trouble-shooting.
2. Allow only qualified people to perform maintenance and troubleshooting on the machine.
3. Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.
4. Do not bypass or tie down any of the door safety switches.
5. Do not open any of the doors while the Primary or Secondary Chambers are above 90^0C
6. Do not enter the chamber unless the Emergency Stop Button is pushed in
7. When opening or closing the chamber door keep clear of the door and ensure that the path for the door is clear.
8. Secure the chamber door when it is open so it cannot move accidentally.
9. Immediately correct any fuel leaks.
10. Do not fill the Primary Chamber more than ¾ full. Overfilling can result in poor burning and damage to the oxidizer.
11. Use proper tools, wear goggles, dust mask and gloves while loading and cleaning the oxidizer.
12. This unit is a confined space. Follow the safety rules for working in a confined space.
13. Ensure that all personnel who are going to operate or work on the machine read and understand the above points and are trained in the operation and maintenance of the machine.

SECTION 2

GENERAL DESCRIPTION

General Description - Thermal Oxidation Concept

The **ECO 1.75 TN 1PVC100L Incinerator system** consists of a **Primary Chamber** and a **Secondary Chamber** (also known as the Afterburner). Both chambers are vessels constructed of steel with a special insulating liner known as refractory.

The **Primary Chamber** has **Hydraulic Roof Lifters** installed for loading of the waste material from the top of the **Primary Chamber** and the front door is used for the removal of residual ash.

The waste material is loaded into the **Primary Chamber** until it is ¾ full. Once ¾ full the **Primary Chamber** is sealed and the combustion cycle begins. This type of system is known as *batch-fed* processing.

Primary Chamber

In the first stage, a burner is used to elevate the temperature of the **Primary Chamber** to ignite the waste. Once the **Primary 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. At these operating temperatures, waste is allowed to fully combust and is rendered sterile.

The **Primary Chamber** operates under *controlled temperature* conditions. The amount of heat released, from the burning of the waste, is controlled by limiting the air into the **Primary Chamber** to less than what is required to complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and burned thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned in the **Primary Chamber** to provide heat while the non-combustible portion accumulates as ash.

In the end, the waste volume is reduced by over 90%. Independent tests have shown that the residual ash is non-hazardous, non-leaching and essentially inert. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass not only protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

Remaining in the **Primary Chamber** are non-combustibles, such as metal and glass, and carbonaceous residue. The incoming air, subjecting the non-combustibles to high temperatures, further burns the carbonaceous residue. The result is an oxidized ash product.

Controlling the gas velocity through the system is an important factor in limiting pollution. The gases flowing from the **Primary Chamber** are a result of the interaction of the air with the waste during the controlled burning process. Both the quantity and velocity of the gas product vary according to chamber temperature conditions and the type of waste being burned. The integrated controls for the **Primary** and **Secondary Chamber** act to minimize peaking activity thus controlling pollution automatically.

The combustion gases released in the **Primary Chamber** then pass into the **Secondary Chamber** through a turbulent mixing zone where ignition takes place and additional combustion air is provided to complete the burning process.

Secondary Chamber

As waste burns in the **Primary Chamber**, gases containing the products of combustion enter the high temperature zone of the **Secondary Chamber** for cleansing. The **Secondary Chamber** is sized to retain the incoming gases for a minimum of 2 seconds at 1000°C. This chamber utilizes a high output, fully modulating dual fuel (diesel & waste oil) burner to maintain the required temperature (even in the absence of energy input from the first stage which is important when processing wet or low energy waste). This stage employs a large blower, tightly controlled by the control system using a variable frequency drive on the motor. The blower 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.

The **Secondary Chamber Blower** air is introduced into the **Secondary Chamber** by an air ring manifold that surrounds the **Secondary Chamber**. The manifold has small air jets called tweers that open into the **Secondary 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) by controlling the speed of the fan and modulating motors on the blower inlet dampers.

The **Secondary Chamber 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 **Primary Chamber** and prevent temperature overruns.

The **Secondary Chamber** burner is a high 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**.

Main Control Panel

There is one **Main Control Panel** that controls all of the interconnecting modules. The Operator has one simple **Human Machine Interface (HMI)** to start the equipment, view system status and change control settings if required. The system utilizes a PLC (programmable logic controller) to automate its functions. All critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion and air pollution abatement.

Protecting the Environment

Why Incinerate?

As society becomes more environmentally conscious, environmental regulations on the proper disposal of solid waste have become more stringent. As a result, incineration has become an environmentally responsible and socially acceptable alternative for handling waste at the point of need. However, incineration does not eliminate the need to landfill waste but it does reduce the amount of waste that must be placed in landfills.

Primary advantages of incineration are:

- It greatly reduces the weight and volume of waste material that must be disposed of in landfills
- It destroys organic materials that may be harmful or that may be degradable to harmful materials in landfills
- The incinerator sterilizes the waste; that is, the high temperatures in incinerators can destroy any pathogens that may be in infectious waste materials
- The incinerator destroys animal or human pathological wastes that the general public finds objectionable to handle or see.

Environmental Concerns

The general public will not accept incineration as an option for treating waste of any kind, if they do not believe that it is safe environmentally. The primary concerns are about air pollutants produced by the incinerator and the toxicity of the residual ash. This section will present some of the terminology that is important to understanding these concerns. The remainder of the manual will describe how an incineration system can be operated and maintained in a way that keeps environmental releases at an acceptable level.

Air Pollutants of Concern

Particulate matter may be defined as fine liquid or solid matter such as dust, smoke, mist, or fumes found in the gaseous emissions from the incinerator. Particulate matter emissions may have a dark or light color. Particulate matter emissions can be described in terms of opacity. Opacity is the degree to which light is obscured by a polluted gas (a clear window has 0 percent opacity while black paper has 100 percent opacity). Opacity may be measured with the naked eye or using an opacity monitor. Particulate matter is a problem because it can cause or aggravate respiratory problems in humans. It also creates aesthetic problems since it is readily noticed and is a nuisance because of soiling of exposed surfaces on houses and cars.

Hydrochloric (HCl) acid is generated when polyvinyl chloride (PVC) plastic (usually clear plastic) material is burned in the incinerator. The appearance of a white plume or cloud a short distance above the stack indicates that HCl is condensing. The major concerns about HCl are that it causes respiratory problems in humans, contributes to acid rain problems, and causes material damage to metals and concrete.

Toxic metals include cadmium, arsenic, beryllium, chromium, nickel, lead, and mercury. These metals may be found in municipal wastes. These metals are known to be hazardous to human health.

Organic compounds are compounds that contain primarily carbon and hydrogen and may also contain other elements such as oxygen, nitrogen, and chlorine in smaller amounts. Some organic compounds are known to cause or are suspected of causing cancer and are considered hazardous air pollutants. The public's primary concern is related to dioxin and furan emissions, but other organic compounds such as benzene and vinyl chloride may be emitted.

Carbon Monoxide (CO) also is generated during combustion if the combustor is not operated properly. (Your automobile generates some amount of CO.) CO is toxic to humans if concentrations are high enough, and it also is an indicator of combustion quality.

Solid Waste Ash Quality

One of the major objectives of incineration is to generate a high quality ash for land disposal. All pathogens should be destroyed, and almost all organic material should be completely burned. Ideally, no large chunks of unburned waste material (other than metals or glass) should remain in the waste. A measure of ash quality is "burnout," which is the percentage of organic material remaining in the waste. For example, a burnout of 95 percent means that the ash can contain only 5 percent organics. Adequately burned and quenched ash may be disposed of in a sanitary (municipal) landfill. The ash should be stored in covered containers or kept wet prior to transport to the landfill to prevent 'fugitive \ emissions.' Individual landfills may have requirements that must be followed in order for your waste to be accepted. You should familiarize yourself with these requirements to prevent refusal of the waste.

The Operator – Your Role

It is the operator's role and responsibility to protect the environment by:

1 Complying with all emission limits and operating practices specified in the permit to operate.
2 Minimizing emissions of particulate matter, HCl, toxic metals, carbon monoxide, and organic compounds through proper incineration;
3 Operating the incinerator to generate high quality ash that is sterile and can be disposed of in landfills;
4 Minimizing particulate matter emissions from ash handling;
5 Disposing of ash properly by sending it to appropriate disposal sites; and
6 Performing the regular maintenance inspections to catch any operational problems early.

Basic Combustion Principles

The Combustion Process

Combustion of Municipal Solid Waste (MSW) is a chemical reaction. In the incinerator, organic materials and oxygen react rapidly and violently to produce combustion gases and energy in the form of heat and light.

Organic Solid Material + Oxygen $\xrightarrow[\text{Heat}]{}$ Combustion Gas + Solid Residue + Energy(Heat)

For the reaction to begin and to keep going, all three elements - organic material, oxygen, and heat-must be present. The organic material used in the reaction comes from two sources, waste and auxiliary fuel. Some organic material is contained in most solid waste types. Depending on the fraction of organics and the specific organic composition, the waste may be adequate to sustain combustion. Auxiliary fuel may be used to maintain combustion if the waste material does not contain enough organic material to maintain high temperatures. The combustion reaction between the organic material and oxygen that causes the organics to burn will occur only after the temperature of the organic material is raised to the point that combustion can begin.

Energy in the form of heat is required to raise the temperatures of the incinerator chamber and organic material and O_2. This energy usually is supplied by the auxiliary fuel burners.

Rate of Combustion Air

The oxygen needed for the combustion reaction is supplied by the ambient combustion air. Combustion air is supplied to the combustion chambers through air ports by natural draft. In general, this air contains about 21 percent oxygen (O_2) and 79 percent nitrogen (N_2), so about 21 percent of the total combustion air fed to the incinerator is oxygen that is available to react with the organic material in the waste and fuel. The nitrogen passes through the chamber mostly unreacted; some nitrogen oxides are formed.

Oxygen Reaction

Solid waste contains two types of organic materials

1. Volatile Matter
2. Fixed Carbon

These two types of materials are involved in distinct types of combustion reactions, and the operating variables that control the two types of reaction are different.

Volatile matter is that portion of the waste that is vaporized (or evaporated) when the waste is heated. Combustion occurs after the material becomes a gas. The combustion variables that influence this reaction are gas temperature, residence time, and mixing.

- A minimum temperature is needed to start and sustain the chemical reaction.
- Residence time is the length of time, generally measured in seconds that the combustion gas spends in the high temperature combustion chamber. The residence time must be long enough for the reaction to be completed before it leaves the high temperature zone.
- Turbulent mixing of the volatile matter and combustion air is required to ensure that the organic material and oxygen are well mixed.

Fixed carbon is the nonvolatile organic portion of the waste. The combustion reaction is a solid-phase reaction that occurs primarily in the waste bed (although some materials may burn in suspension). Key operating parameters are bed temperature, solids retention time, and mechanical turbulence in the bed.

- The solids retention time is the length of time that the waste bed remains in the Primary Chamber.
- Mechanical turbulence of the bed is needed to expose all the solid waste to oxygen for complete burnout. Without mechanical turbulence, the ash formed during combustion can cover the unburned waste and prevent the oxygen necessary for combustion from contacting the waste.

Products of complete combustion are:

- Carbon dioxide
- Water

One example of volatile waste is backyard charcoal grill with starting fluid. The starting fluid is highly volatile. When put on the charcoal and ignited with a match, it rapidly volatilizes and burns. The charcoal contains less volatile matter and primarily burns slowly as a fixed carbon bed.

Operating Factors Related to Combustion

The three operating factors that have the greatest effects on the combustion reaction are:

- Combustion airflow rate and distribution,
- Operating temperatures, and
- Waste feed rate and characteristics.

These three factors are all related. Controlling them controls the combustion reaction.

Stoichiometric Air

In the chemical reaction between organic materials and oxygen, the amount of oxygen required under ideal or "perfect" conditions to burn all of the organic materials with no oxygen left over is called the stoichiometric (or theoretical) oxygen level. The amount of combustion air associated with that oxygen level is called the stoichiometric air level. At stoichiometric air level the combustion gas would contain no oxygen because it would all be used in the combustion reaction.

Substoichiometric Air

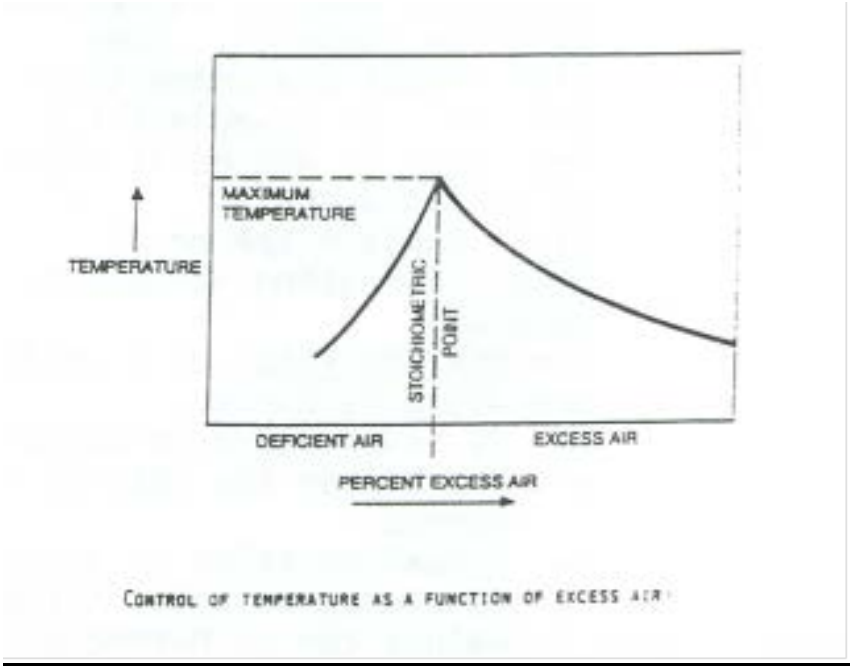
Airflows less than those required at stoichiometric levels are called deficient air or substoichiometric starved-air levels. Under starved-air conditions, the combustion gas would again contain no oxygen, but organics also would remain because combustion is not complete.

Excess Air

Air flows greater than those required at stoichiometric levels are called excess-air levels. Typically an incinerator operates with an overall 140 to 200 percent excess air level. That is, the incinerator operates with one and one-half to two times more air than required at stoichiometric levels. Excess air is used to assure that enough oxygen is available for complete combustion.

Control of Temperature as a Function of Air Level

Maximum combustion temperatures are always attained at stoichiometric conditions. As the amount of excess air is increased above the stoichiometric point, the temperature in the incinerator drops because energy is used to heat the combustion air. If the amount of combustion air is too great, the temperature drops below “good combustion temperature," and undesirable combustion products are generated as a result of incomplete combustion. As the amount of excess air is decreased, the combustion temperature increases until it becomes maximum at the stoichiometric point. Below the stoichiometric point, the temperature decreases because complete combustion has not occurred.



CONTROL OF TEMPERATURE AS A FUNCTION OF EXCESS AIR

The relationship of how combustion air level can affect temperature has just been shown. Temperature also plays an important role in the combustion of waste. Temperatures need to be maintained at levels high enough to ensure pathogen destruction and to sustain the combustion reaction. However, temperatures that are too high also cause problems. Continuous exposure of the combustor refractory to high temperatures is generally not desirable because it can cause the ash to fuse and can cause damage to the refractory.

Waste Characteristics

The primary characteristics of the waste that affect the combustion reaction are:

- The heating value
- The moisture content
- The chlorine content

Different wastes have different heating values and moisture contents. They will affect the combustion process.

The HEATING VALUE of a waste is a measure of the energy released when the waste is burned. It is measured in units of Btu/lb (J/kg). A heating value of about 5,000 Btu/lb (11.6×10^{-6} J/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 heating value of the waste can be used to calculate total heat input to the incinerator where:

Heat Input (Btu/h) = Feed Rate (lb/h) x Heating Value (Btu/lb)

Heat input to the incinerator will affect temperature. More heat input yields higher temperature. Heat input also will affect air requirements; more air is required (1 SCF/100 Btu).

MOISTURE is evaporated from the waste as the temperature of the waste is raised in the combustion chamber. It passes through the incinerator, unchanged, as water vapor. Evaporation of moisture uses energy and reduces the temperature in the combustion chamber.

CHLORINE in plastics or solvents in the waste feed will react to form hydrochloric acid (HCl). This HCl can be an emission problem. It can create corrosion problems of the equipment downstream from the incinerator.

The heating value (Btu value) and moisture varies widely. Compare plastics (high Btu, no moisture) to beddings, shavings, etc. to anatomical.

Summary of Key Operation Factors Affecting Combustion

1 Key factors are interrelated.
2 Air quality/distribution
3 Sufficient air for complete reaction
4 Distributed to promote mixing
5 Mixing
6 Assure contact of oxygen and organics
7 Temperature
8 High enough to sustain combustion
9 High enough to have complete reaction
10 Residence/retention time
11 Sufficient time to allow reaction to complete

Waste Characteristics are also important

12 Heating value
13 Measure of energy released

14 Heat input determines air required
15 Moisture content
16 Requires energy to vaporize water
17 Chlorine content
18 Affects HCl emissions

This summarizes the key parameters affecting combustion.

Products of Combustion Reaction

Complete Combustion

The primary products of waste incineration are:

- Combustion gases
- Solid residue (ash)
- Energy

The primary objectives of the combustion process are to generate an ash residue that is sterile (free of pathogens) and does not contain unburned, recognizable wastes; and to minimize air pollutants in the combustion gas stream.

The organic materials that enter the incinerator with the waste and fuel are primarily made up of carbon, hydrogen, and oxygen. Ideally, these organic materials react with oxygen in the combustion gas to form carbon dioxide and water vapor. The chemical reaction for this ideal situation is

$$\text{Organics} + O_2 + \text{Heat} \longrightarrow CO_2 + H_2O + \text{Heat}$$
(C, H, 0)

This ideal reaction represents complete combustion.

Incomplete Combustion

However, this ideal reaction does not occur in operating 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. The most common product of incomplete combustion is CO. Another product of incomplete combustion that often is emitted under poor mixing conditions or high temperature, low excess air conditions, is elemental carbon (or soot). The soot particles are very fine and generally result in high opacity at the combustion stack. Other products of incomplete combustion that cause concern because of their health impacts 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 bed 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 ash; this is typical…it is atypical to have 100 percent combustion of ash bed. Under poor conditions (low temperature, low turbulence in ash bed) may have pathogens remaining in ash; i.e., may not sterilize ash.

Combustion Indicators

The information presented in the above section suggests that the following indicators can be used to monitor combustion quality.

Opacity

The opacity of the combustion gas stream is a measure of the degree to which the stack gas plume blocks light.

- High opacities indicate high emissions.
- Opacity is primarily caused by noncombustible ash or uncombusted carbon (soot) in the flue gas.
- High opacities can indicate poor mixing or low levels of combustion air.
- High opacities also may be generated by high levels of HCl emissions or poor burner operation in the secondary chamber.

If a large amount of water vapor is present in the combustion gas, the water can condense when it cools as it leaves the stack forming a dense white "steam plume." This is not an indicator of poor combustion and should not be confused with a black or white smoke plume caused by soot or acid gases. Opacity can be visually determined by a person or measured by an instrument.

Other indicators which provide information about combustion conditions are measurements of the combustion gas oxygen and CO levels. However, these measurements require instruments and most facilities do not have those instruments.

Ash Quality

Visual appearance of 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. Noted increases in combustibles in the ash indicate a combustion problem which may include bed temperatures that are too low, improper distribution of combustion air in the bed, or insufficient waste retention times.

SECTION 3

PHOTOS OF THE INCINERATOR

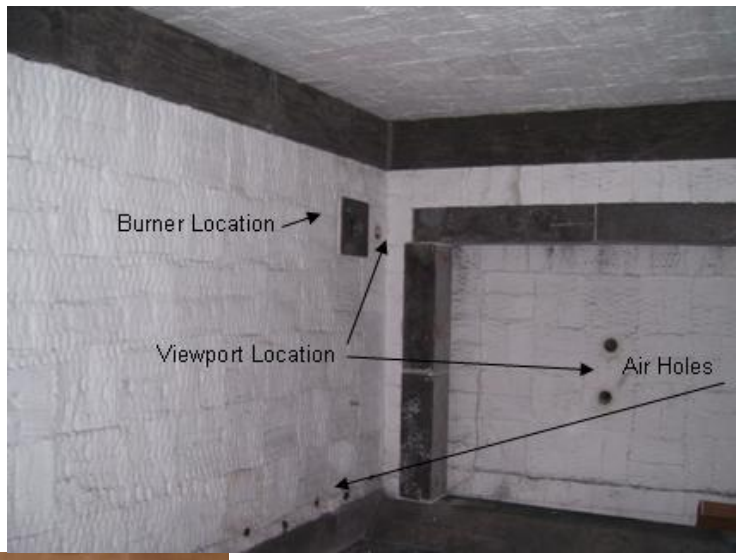
NOTE some of these are sample photos and may not depict the actual Incinerator components

Primary (right) & Secondary (left) Chambers

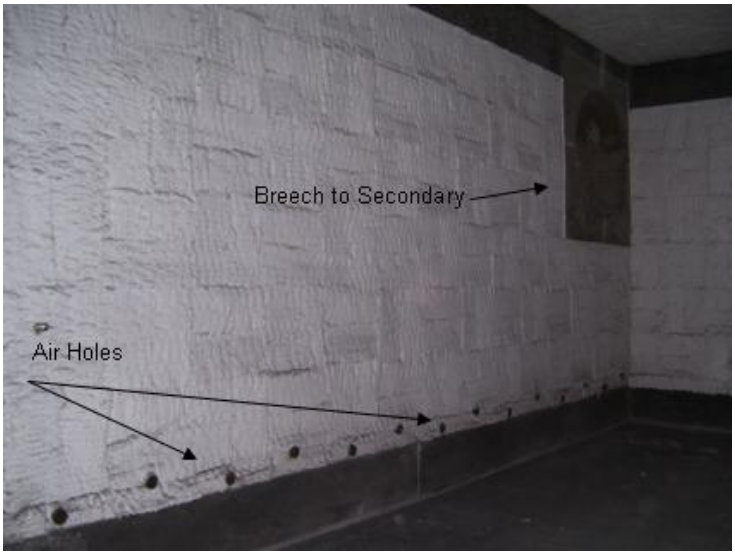
NOTE **Stack sections and breech have not been installed.**

Primary Chamber Access Door View

Primary Chamber Interior View (sample picture)



Floor and grate detail



Secondary Chamber Door View

Secondary Chamber / T-section View

Primary Chamber Blower

Secondary Chamber Blower

Adjustable Damper and Modutrol Motor

Primary Chamber Burner

NOTE **Burner is shown without cover installed.**

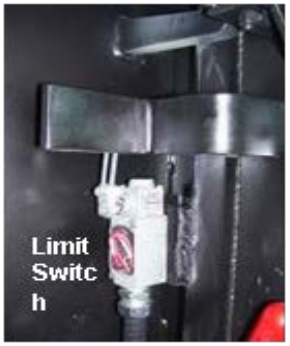
Diesel Tank (4,500lt)

Secondary Chamber Burner

Waste Oil Tank (5,000lt)

Main Control Panel

Thermocouple, Viewport and Limit Switch



T-Stack and Stack Sections

Spark Arrestor

SECTION 4

ASSEMBLY & INSTALLATION INSTRUCTIONS

General Assembly and Installation Overview

The incinerator is factory pre-assembled to ensure proper fit then shipped disassembled. On-site assembly by certified trade's people is required. Trades people (Riggers, Mechanical Contractors, Millwrights, Electricians, Gas Fitters, etc) are to be arranged by Purchaser and/or Contractor.

This is a **general overview**, therefore, project specific details must still be considered. Please refer to relevant data and drawings supplied by EWS.

Purchaser/Contractor Responsibilities

These responsibilities include, but are not limited to, the following:

1. Ensure all concrete and structural steelwork, as may be required, is adequate to support the incinerator and associated equipment. The Purchaser/Contractor is responsible for all concrete design such as slab thickness, footing depths and dimensions and any placement reinforcement so as to be consistent with all applicable building codes.

2. Supply of any anchor bolts when applicable.

3. Provide all utility services to the equipment including fuel, electrical, water, air, etc, as may be required.

4. Provide adequate air makeup to the incinerator room through forced air circulation blowers, air intakes and/or opened louvers to avoid the creation of negative pressures within the building.

5. Observe caution in the selection of materials and coating of building walls or other structural components to the incinerator area giving due consideration to high-localized temperatures of the incinerator.

6. Provide all external thermal insulation when required on steam piping, water piping, etc.

   NOTE External thermal insulation should never be applied to any surface of the incinerator or refractory lined stacks and breeching. If applied to these surfaces, structural damage may result.

7. Provide proper roof thimbles, clearances, flashing and counter flashing around all roof penetrations, including the incinerator stack.

8. Guying of all stacks (if required) is to be done by the Purchaser/Contractor. Guying should be at three points at 120° apart or four points at 90° apart. The Purchaser/Contractor provides design of guying and guying connection points to the stacks. Torque draw band bolts to 35 lbs. during stack assembly.

9. Provide proper protection of all equipment from damage, vandalism and weather, while on-site and/or when installation is in progress.

10. Provide all touch up painting and cleanup of equipment after erection.

11. Inspect and field weld miscellaneous flanges, when applicable.

12. Supply all main fuel line regulators at connection points to the Incinerator. Fuel lines should be sized for maximum pressures and instantaneous fuel flow at cold starting. Pressures should be based under flow conditions, not static. Static pressure should never exceed the design pressure of the pressure regulator. Gas volume includes burner pilot requirements.

13. General Arrangement drawings are normally provided by EWS. As soon as possible after acknowledgement of a Purchaser/Contractor's order, it is the responsibility of the Purchaser/Contractor to provide EWS with all applicable sketches, layouts, building drawings, roof and floor elevations and other pertinent information to allow preparation of the General Arrangement drawings. With this information, the Purchaser/Contractor's will provide desired orientation of the chambers.

14. The Purchaser/Contractor must recognize the importance of proper waste material descriptions concerning physical and chemical properties. Changes in waste composition to be incinerated should be made known to EWS, as soon as possible.

15. It is the Purchaser/Contractor's responsibility to obtain all construction, operating and environmental/air emissions permits as may be required in the area of jurisdiction for the incinerator equipment. EWS will assist in supplying all technical information required for these permits to the Purchaser/Contractor.

16. The Purchaser/Contractor must be aware that certain components will be broken down for shipment purposes and reassembly will be required in the field by the Purchaser/Contractor.

17. Locating and mounting the incinerator in a confined area should be avoided. The Purchaser/Contractor should maintain ample space around all equipment for maintenance, cleaning and safety considerations. A rule of thumb would be to provide a minimum of six feet from all major equipment surfaces and edges. Always allow proper space for the swing radius of loading doors, cleanout doors and electrical panel doors. If space limitations exist, it is the Purchaser/Contractor's responsibility to make EWS aware of these dimensional restraints so that modifications may be considered.

18. Do not scale drawings: If certain dimensions are required which are not shown on drawings, the Purchaser/Contractor should contact EWS Project Manager. 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 unless so indicated. EWS reserves the right to change equipment dimensions as required for design purposes.

19. All drawing dimensions are typically subject to ¼"tolerances.

20. If the refractory is shipped in the green condition, the refractory has not been heat cured. This curing process must be accomplished in the field after final erection and assembly. It is understood that the Purchaser/Contractor will provide all required utilities for this curing process and initial equipment operation for adjustments at no expense to EWS including but not limited to fuel, electrical, water, etc.

21. Due to the physical size of the incinerator, the unit is shipped partially dismantled and will, therefore, require reassembly in the field. Consult EWS for maximum component weights so that properly sized cranes are available at the site for unloading and erecting. Purchaser/Contractor may, also therefore, have to reinstall electrical components and control connections, burners, blowers, lifters, etc. These connections are normally of the flexible type with leads marked.

22. Lifting lugs are provided on chambers, stacks, and major accessories. These lugs should be used in setting the pieces into position. Do not attach lifting chains or cables to piping, control panel or mounting flanges as they may be damaged. Avoid dragging lifting gear across painted surfaces as this will cause damage to the high temperature paint. When placing the incinerator into position be extremely careful not to subject the refractory to mechanical shock as this may result in refractory damage.

Step by Step Assembly and Installation Instructions

The following **sequence** applies specifically to the Meliadine Waste Incinerator.

Trades-people required for the following steps:

Forklift Operator, Crane Operator, Riggers, Electrician and Mechanical Contractors (pipe and gas fitter)

Please refer to the supplied drawings and data.

Foundation Drawing: Anchor Bolt and Loading Diagram ECO1.75TN1PVC100L-00D rev.0

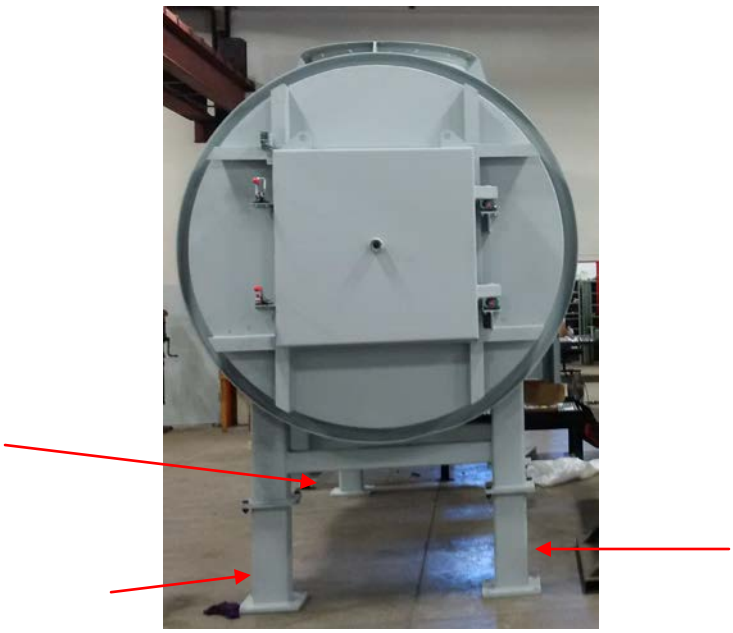
1. The incinerator and related components must be installed on a level concrete pad. It is recommended that appropriate consultation with civil engineers and/or architects is taken before designing an appropriate foundation for the equipment.

2. Please refer to General Arrangement Drawing ECO1.75TN1PVC100L-00A rev.1 and its Bill of Materials.

Place the Primary Chamber and Secondary Chamber on the Foundation

3. Locate leg extension for the Secondary Chamber and put into position.

4. Once the leg extensions have been put into place, using a crane, lift the **Secondary Chamber** into position and connect the leg extensions.



Leg extensions

5. Position the Secondary Chamber (item 2) beside the Primary Chamber (Item 1) on the level concrete pad. Ensure that the breech openings on each Chamber are facing each other.

6. Shim with steel shim plates to ensure the Secondary Chamber is level. This is required to prevent rocking, or any movement of the **Secondary Chamber.**

Connecting the Breech to the Secondary Chamber

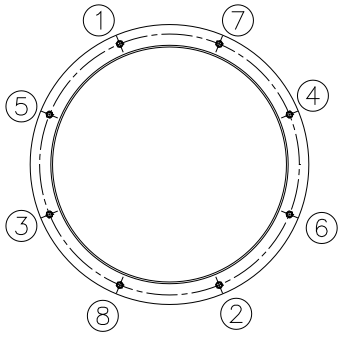
1. Install the **Secondary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Secondary Breech Gasket** to line up with the flange bolt holes. Press **Secondary Breech Gasket** onto flange securely.

Gasket adhesive spray being applied

Correctly Installed Gasket

2. Raise the **Breech** (Item 7) with forklift and slings, once the **Breech** is 8 to 13 cm from the flange, use alignment bars to help with the final alignment of the two (2) breech flanges, as shown below.

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



Correctly installed Breech on Secondary Chamber

Position the Primary Chamber

1. Install the **Primary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Primary Breech Gasket** to line up with the flange bolt holes. Press **Primary Breech Gasket** onto flange securely.

Gasket NOT installed

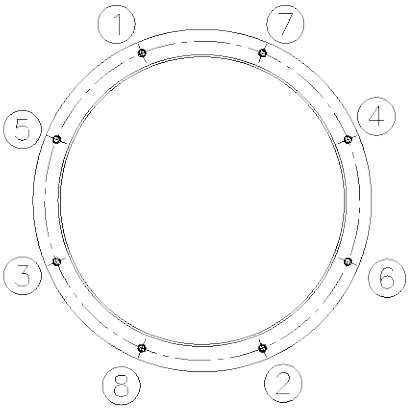
Correctly Installed Gasket

2. While constantly checking alignment of the **Breech** move **Primary Chamber** along the floor using the forklift and skates until the flanges are aligned.

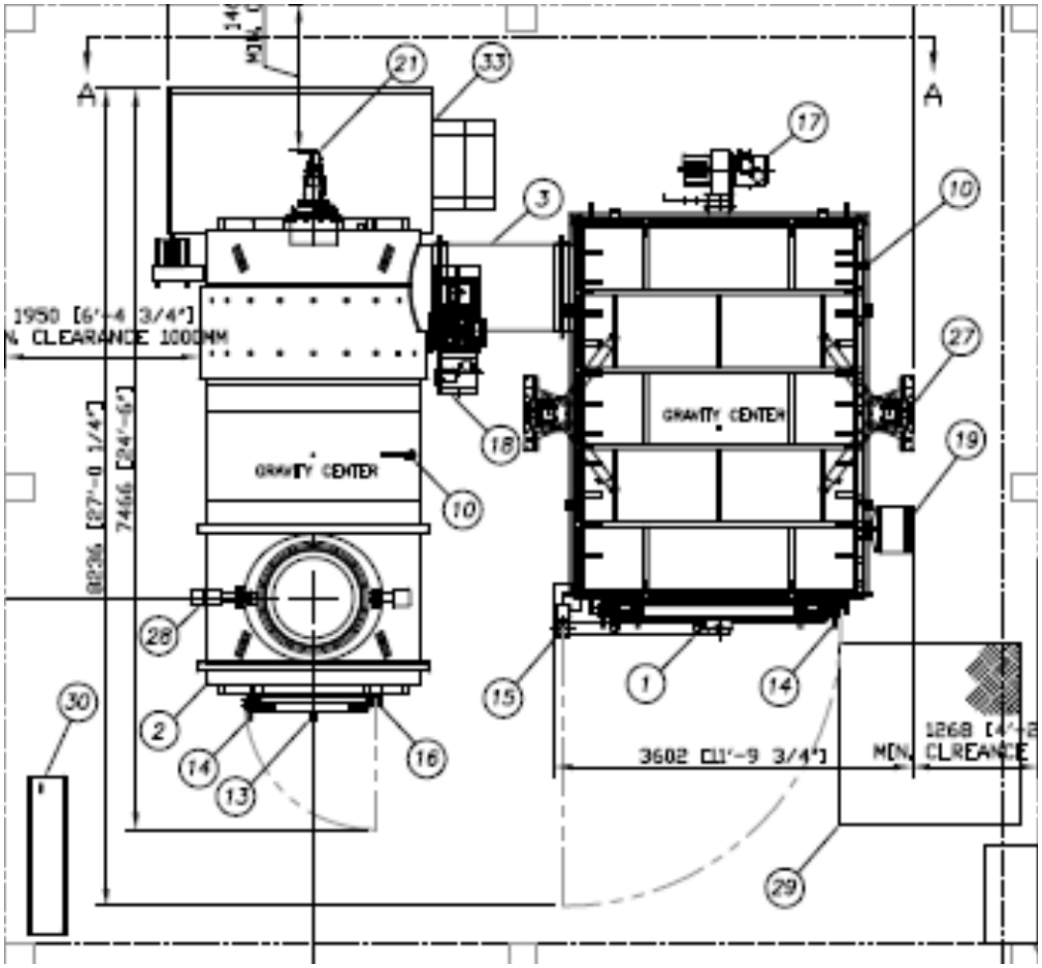
NOTE Do NOT pull the Primary Chamber closer to the Secondary Chamber with the flange bolts. Doing so will bow the steep plate, in turn damaging the breech refractory.

3. Once breech flanges are aligned bolt flanges together, shim and level the Primary Chamber with steel shim plates. Support pads should be shimmed as required to prevent rocking, or any movement of the Primary Chamber.

4. Using the numerical order described in the pattern below using hardware provided.



Correctly Installed Breech on Primary Chamber



NOTE The diagram above shows the burners and blowers already attached to the Primary and Secondary Chambers. When positioning the Primary Chamber, Breech and Secondary Chamber, these items will not be attached.

Installing the Stack

Install stack gaskets between stack sections.

Install refractory-lined *T-Stack Section* on top of the *Secondary Chamber* using the hardware provided. Then install the next four *Stack Sections and the spark arrestor* as per the drawing using hardware provided.

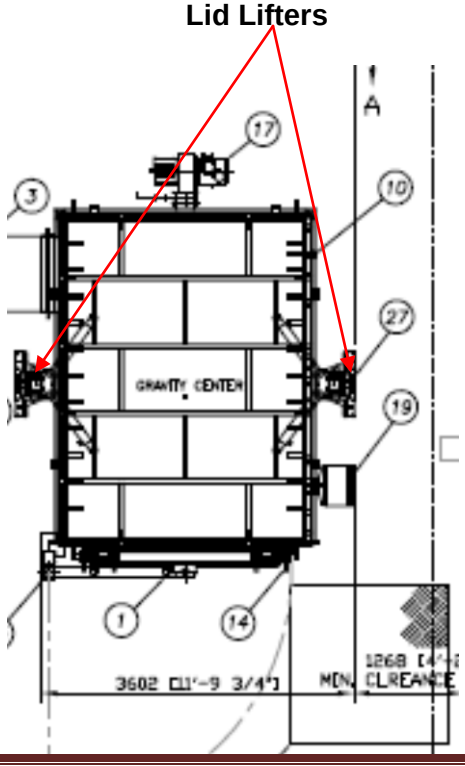
T-Stack and Stack Sections

This is a Sample Photo only of Erection of the Stack Sections

Installing the Lid Lifters

1. Place the lid lifters (item 27) on either end of the Primary Chamber. The slave column, the one without the hydraulic power pack, is to be located in between the chambers.

Lid Lifters



2. Once lifters are in place, shim and level, do not exceed 2.54 cm under the column. Anchor the columns to the floor.

3. Install the pre-assembled hydraulic pump on the master column reinforcement and connect the hydraulic hose and piping.

4. Install the limit switches, proximity switches and solenoid valves with the hardware provided.

5. Install the control stations for the lid lifters (attached to junction box at the master column). Location determined by customer.

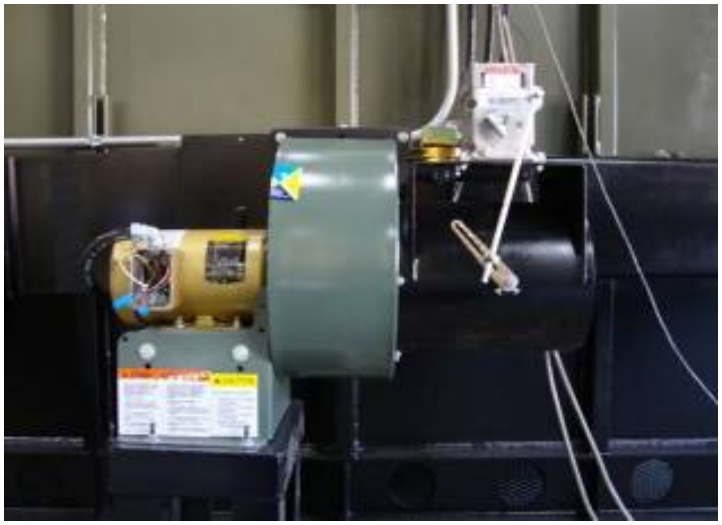
For further detail consult the OEM manual of this lifter in 6515-S-265-008-280-EDS-0015_Sub002.pages175to190

Assembling and Installing the Primary Chamber Blower

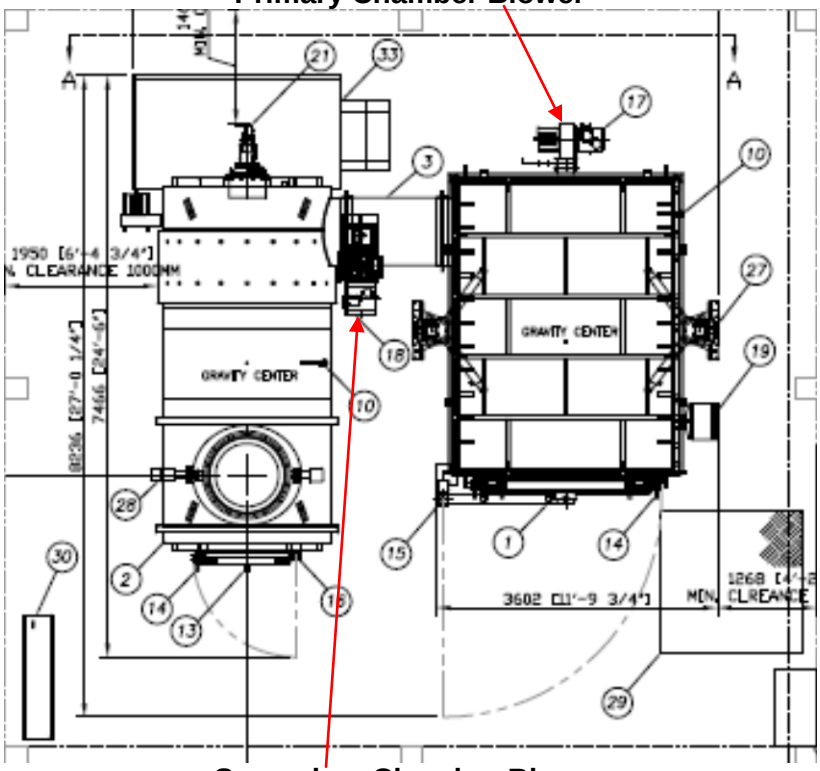
1. Place the **Primary Blower** mounting frame where the **Primary Blower** is to be installed.

2. Install **Primary Blower**, shim and level as required with steel shim plates until the flanges are align. Support pads should be shimmed as required to prevent rocking.

3. Bolt together using bolts provided after alignment of all bolt holes



Primary Chamber Blower



Secondary Chamber Blower

Assembling and Installing the Secondary Chamber Blower

1. Place the **Secondary Blower** mounting frame where the **Secondary Blower** is to be installed.

2. Install **Secondary Blower**, shim and level as required with steel shim plates until the connecting flanges are level.

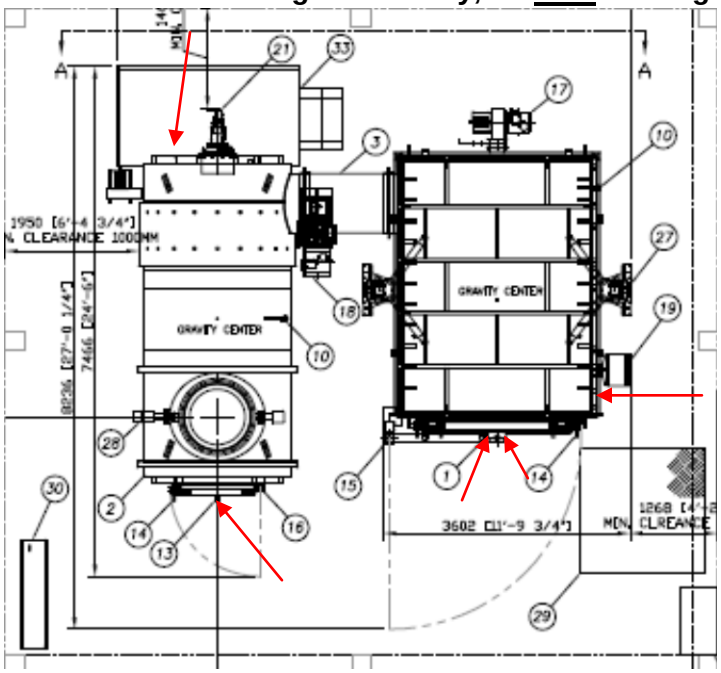
3. Bolt together using bolts provided after alignment of all bolt holes.

Secondary Chamber Blower

Installing the View Ports

1. Install four (5) 2" threaded **Viewports** at positions indicated in red below on **Primary Chamber** door, the left hand side of the **Primary Chamber Burner,** the **Secondary Chamber** door and the right hand side of the **Secondary Chamber Burner.**

NOTE **The viewports should be hand tightened only, do NOT over tighten.**

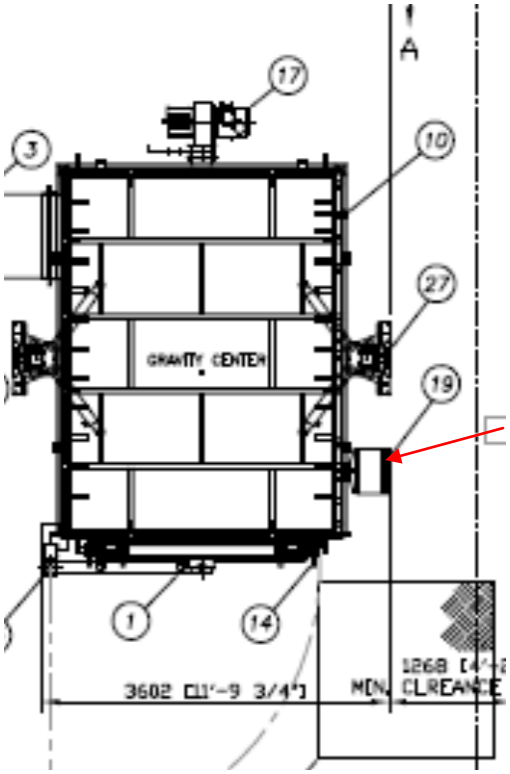


Installing the Primary Chamber Burner

1. Install the **Primary Burner** and burner gasket in the burner port located on the right side of the **Primary Chamber**.

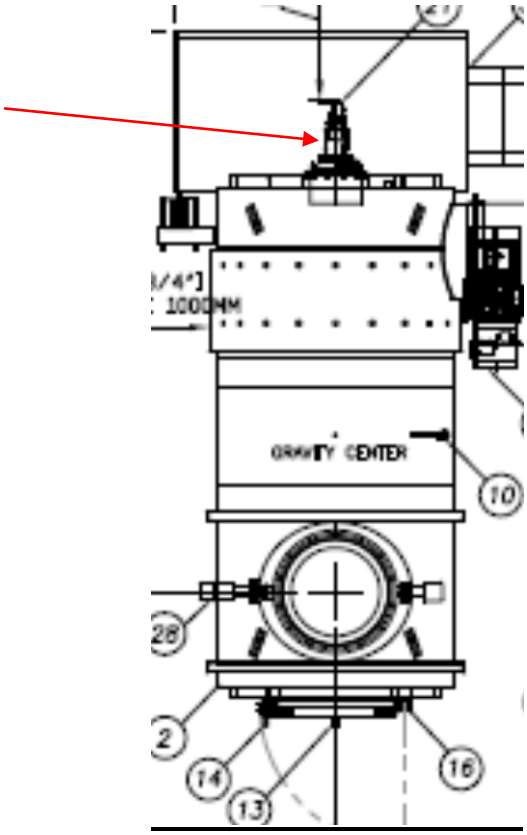
2. Bolt together using provided hardware after alignment of all bolt holes.

Primary Burner shown without red cover installed.



Installing the Secondary Chamber Dual Burner

1. Install the **Secondary Chamber Burner** and gasket in secondary burner ports using the hardware provided. The fuel train is pre-assembled and the final installation to follow the P&ID drawing



It is the customer's responsibility to conform to any local codes when installing the Waste Oil System.

Positioning and Installing the Diesel Tank

The Fuel Tanks are to be installed at ground level as per the site layout. Locations are to be determined by the customer to satisfy all local codes. Interconnecting piping and filters for each burner have been shipped with the equipment

Fuel Connections

Reference: General Arrangement ECO1.75TN1PVC100L-00A rev.1 and P&ID ECO1.75TN1PVC100L-00B rev.1 drawings

NOTE All fuel connections to be done by a certified technician and should satisfy all local codes (all lines to be pressure tested), including the distance between the incinerator system and the fuel tanks. If not properly installed and maintained, the waste oil tank (see image) can become a serious threat to the environment. Ensure the installation follows all local regulations and environmental protection measures.

Even though the tank is double walled, it is highly recommended that the installation site of the storage tank be equipped with a secondary containment system consisting of the following: dikes, berms, or retaining walls and a floor. The floor should cover the entire area within the dike, berm or retaining wall.

WASTE OIL PIPING TRAIN
The Waste Oil piping train consists of:
1. Pump skid.
2. Interconnecting piping.
3. Fuel train to dual burner.

When installing the waste oil piping train check to ensure that:
- Piping is clean.
- That the pipe has been reamed and free of burrs
- The work is done to trade standards

To perform the installation a (½" and 1") pipe threader is needed.

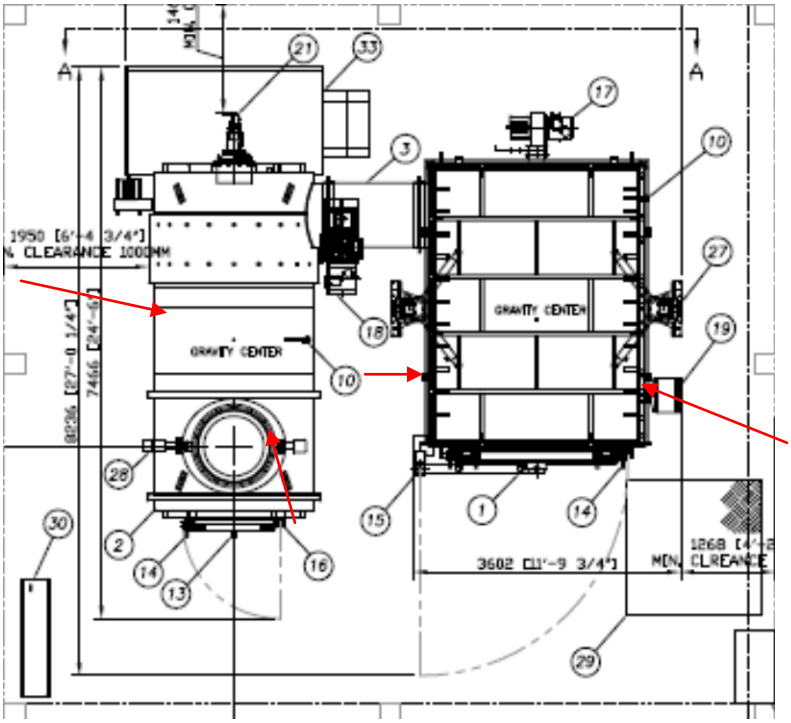
Note: When the pipe installation is complete flush out the line to remove any sediment and dirt that may have contaminated the pipes.

This incinerator system includes two (2) waste oil totes and their correspondent containment, as well as spill kits according to the volume, these items are to be deployed by the customer according with their waste management plan.

Also, two (2) ash bins are included for the storage of the ash removed from the incinerator.

Installing the Thermocouples

1. Install the four (4) ¾" threaded **Thermocouples** at the positions indicated in red below: two (2) in the **Primary Chamber,** one (1) on **Secondary Chamber** and one (1) on **T-Stack**



Installing the Weigh Scale

The weigh scale is to be installed closer to the loading point (to be determined by customer) and anchor it (note: the loading of this incinerator is intended to be through the roof when the lid is in the open position.

Electrical Connections

Reference: Electrical Drawings ECO1.75TN1PVC100L-10A / B/ C/ D rev.0 (17drawings)

NOTE All electrical connections, terminations and conduit installation to be done by a certified electrician and should satisfy all local codes.

1. The **Main Control Panel** should be installed at a minimum of 8' from the Incinerator system.

2. Wiring is necessary (customer's scope) from the power source to the **Main Control Panel** and between the **Main Control Panel** and the **Junction Boxes** on the incinerator and all Teck Cable from the junction boxes to the components.

3. The **Thermocouples** must be wired directly to the thermocouple input card on the **PLC** with the thermocouple wire provided, without splicing the wire. Interconnecting cable has been shipped with the equipment

4. Connect terminal wires. Connect main electrical feed through conduit connection in the bottom of the panel enclosure to the line terminals on the disconnect switch.

5. Run cables to scale and tank

Start Up and Commissioning EWS Field Services

Do not attempt to place the equipment into operation until an EWS Service Technician has inspected all equipment and interlocks.

1. Upon completion of mechanical erection, interconnection of equipment and provisions of utilities as described above, arrangements should be made with the EWS field service department for scheduling of a service technician for initial start-up.

2. An EWS representative must perform start-up of all incinerator systems unless specifically arranged otherwise in writing by EWS.

3. Attempts to start-up incinerator systems by the buyer without prior written approval may result in revocation of all expressed or implied warranties.

SECTION 5

OPERATING INSTRUCTIONS

Important Information

Proper operating and maintenance procedures must be followed in order for the ECO Model Incinerator system to perform at maximum efficiency.

Do not attempt to start or operate this equipment until this Operator 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 safety procedures outlined in this Manual, however, no amount of written instruction can replace good judgment and safe operating practices.

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 ECO Model Incinerator system 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 procedures, outlined in Section 6, be followed diligently. It is advisable to keep an equipment log for recording maintenance activities along with unusual operation.

NOTE

In the event that the equipment is not operating in the normal manner, contact Eco Waste Solutions immediately at (905) 634-7022 and ask for Customer Service Manager. It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Design Specification Criteria

The **ECO 1.75 TN 1PVC100L incinerator systems** was designed specifically for the **Meliadine Mine.** Based on information provided, the EWS team designed an incinerator with the following criteria in mind.

Waste Description and Assumptions

Solid waste:

- Food waste (food, food packaging and containers, plastic and paper waste from food preparation) - 50%
- Domestic waste (paper, plastics, bottles, newsprint, cans, cardboard) - 40% Packaging (cardboard boxes, paper, plastic containers, plastic film, Styrofoam, poly-weave bags) - 10%
- Absorbents (Rags, wipes, spill cleanup materials) - negligible
- Medical waste (bandages, dressings, gloves, swabs, syringes, sharps) - Negligible

Waste Oil:

- Used Oils (hydraulic, transmission, motor, crankcase, gear box, synthetic and brake fluids)

The waste is expected to be bagged or stored in skips/bins around the mine operation and then brought to the incinerator building by truck. The waste oils will be brought to the incinerator by totes (handling by forklift or pallet jack).

Waste Quantity

The incinerator is designed to process and treat the waste generated on site, up to 1,750 kg per day. Therefore the ECO 1.75TN 1PVC100L incinerator system was selected, as it will process up to 1,750 kg of camp waste per day in a single batch.

Incinerator Design Parameters

Incinerator Design Parameters	Unit	Details
Secondary Chamber Operating Temperature	°C	1000
Secondary Chamber Retention Time	s	2 (minimum)
Incineration capacity	Kg/day	~~1700~~ 1750
Charge per cycle	Kg	1700
Burn Cycle Duration for entire load	h	less than 10
Cool Down Cycle Duration	h	8 to 12

NOTE

This incinerator was only designed for the type of waste and amount of waste mentioned above. It is important that the waste quantities and characteristics described above are processed in the incinerator. Otherwise, the incinerator system will not operate properly.

It is also important to note that some waste-streams are unacceptable and SHOULD NOT be processed in the incinerator.

Unacceptable Waste-streams

The following is a list of some of the waste streams that should not be processed in this system.

Waste Materials Not Suitable for Processing in Eco Waste Solutions Technology

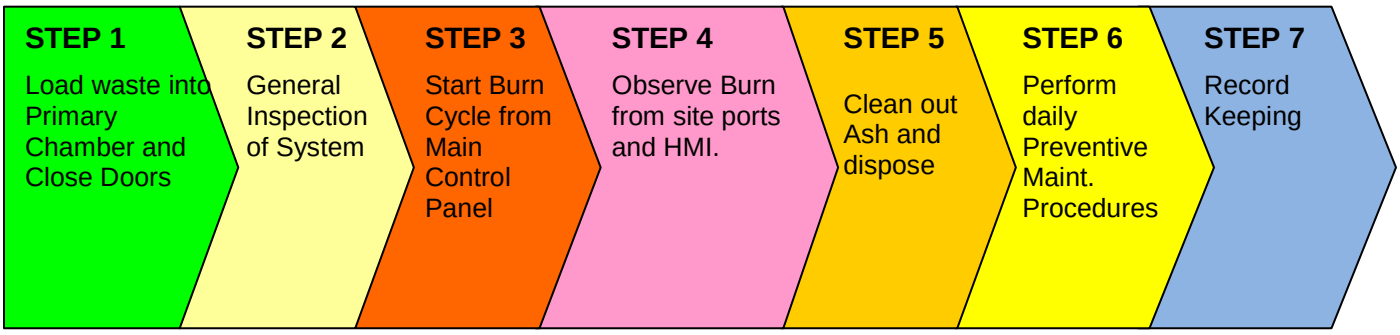
Solid Waste	Description	Origin
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions	From vehicles and equipment maintenance shop
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils	Construction activity
Radioactive Materials	Smoke detectors, laboratory wastes	From Buildings, laboratories
Potentially Explosive Materials	Large propane tanks, other pressurized vessels. Actual explosives	From warehouse, plant and production facilities
Heavy Metals	Items containing lead, mercury, cadmium, for example: batteries, electronic devices, fittings, old pipe work, fluorescent light bulbs, electrical switches, thermometers, PVC plastics, aluminum solder, photovoltaic cells	From maintenance activities, operations and construction activities
Liquid Waste	**Description**	**Origin**
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels	From warehouse, plant and production facilities
Solvents	Solvents such as acetone, xylene, methanol	From vehicles and equipment maintenance shop

Important Notes:

1. These lists are guides and should not be assumed to be an exhaustive list of materials
2. 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

General Operating Overview

The operation of the **ECO 1.75TN 1PVC100L Incinerator** package follows 7 general steps that take place over a 24-hour period.



Although all 7 steps are critical in the general operation of the incinerator system, this section of the manual focuses on **Step 1, Step 3** and **Step 4** and how to start the system and monitor it during operation.

It is assumed, at this point, that the waste material is properly loaded with the weight, density and type the incinerator is designed for, as outlined on page 5 of this section.

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.

This section will also cover **Step 7** on how to use the historical charts, store incinerator data, and access incinerator historical information for record keeping purposes.

Monitoring and Data Acquisition System

Overview

The **Human Machine Interface (HMI)** system automatically monitors the entire process and all system inputs are recorded and logged for record-keeping purposes and also allows for historical trending of key operating conditions.

The integrated **Human Machine Interface (HMI)** in the Main Control Panel monitors and records the following:

1. Temperature sensors
2. Differential pressure sensor with transmitter (draft)
3. Monitoring of burner functions
4. Auxiliary burner operation and fan amperage monitoring via current transducer
5. Door position interlock monitoring
6. High temperature limit and interlock
7. Low Fuel level limit and interlock
8. Air proving switch interlocks
9. Waste loading records

All data can be transferred to storage by using USB port (to transfer to PC to print)

HMI Operator Interface

Main Control Panel Components

Number	Name	Purpose
1	**Main Disconnect Switch**	Isolates the incinerator from its source of electric power.
2	**Human Machine (Operator) Interface**	Displays various screens reflecting system performance.
3	**Control Power ON**	1. Green light indicates the control power in the panel is on. 2. Pushing it if the **Emergency-Stop** is out will turn on the control power.
4	**Emergency Stop Pushbutton**	When pushed, shuts down the system and disables any possibility of starting it.
5	**Communications Port**	Allows for communication to/from the PLC
6	**Start Switch**	Activates the system

The Human Machine Interface (HMI)

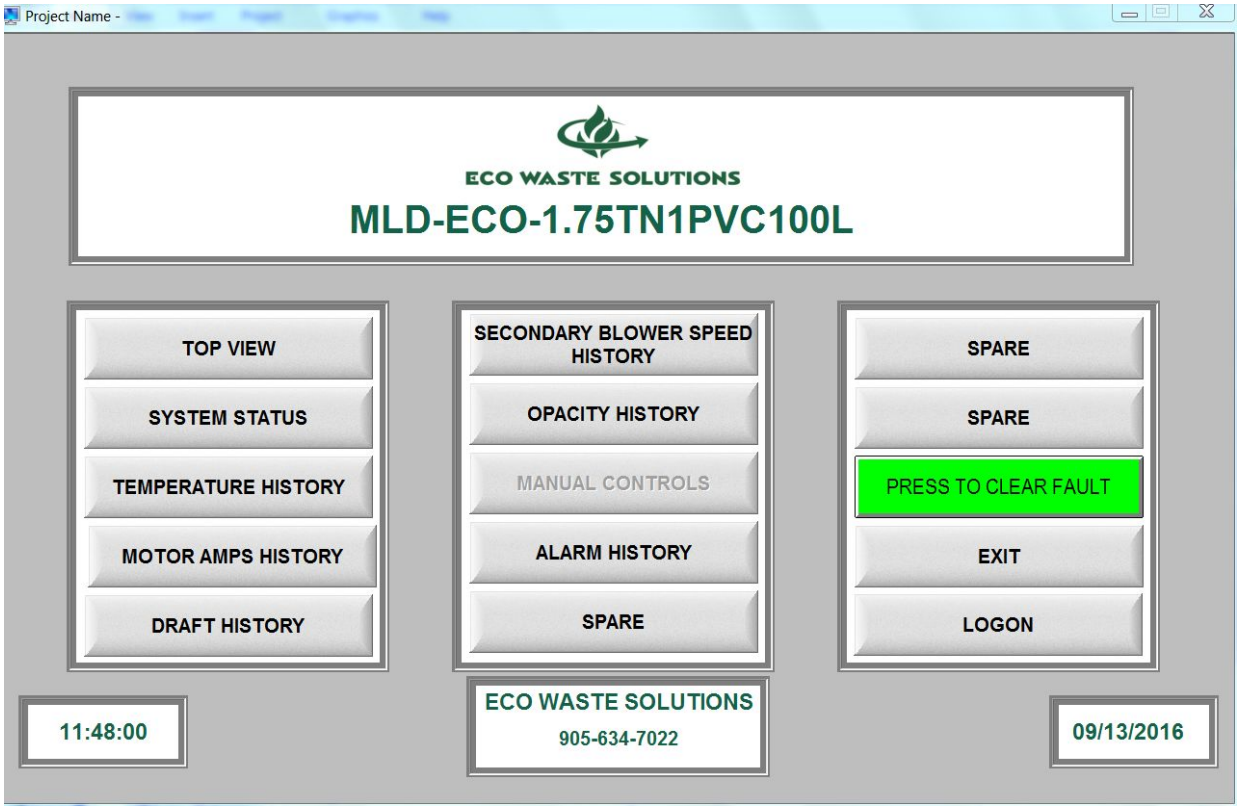
The **Human Machine Interface (HMI)** controls the operation of the incinerator directly from the **Main Control Panel.**

The **Main Menu** screen displays all the available options for viewing the system in operation.

The **Human Machine Interface (HMI)** has a touch-screen and items can be selected by touching them on the screen.

Main Menu

The first screen the operator will view is the **Main Menu** (see below).



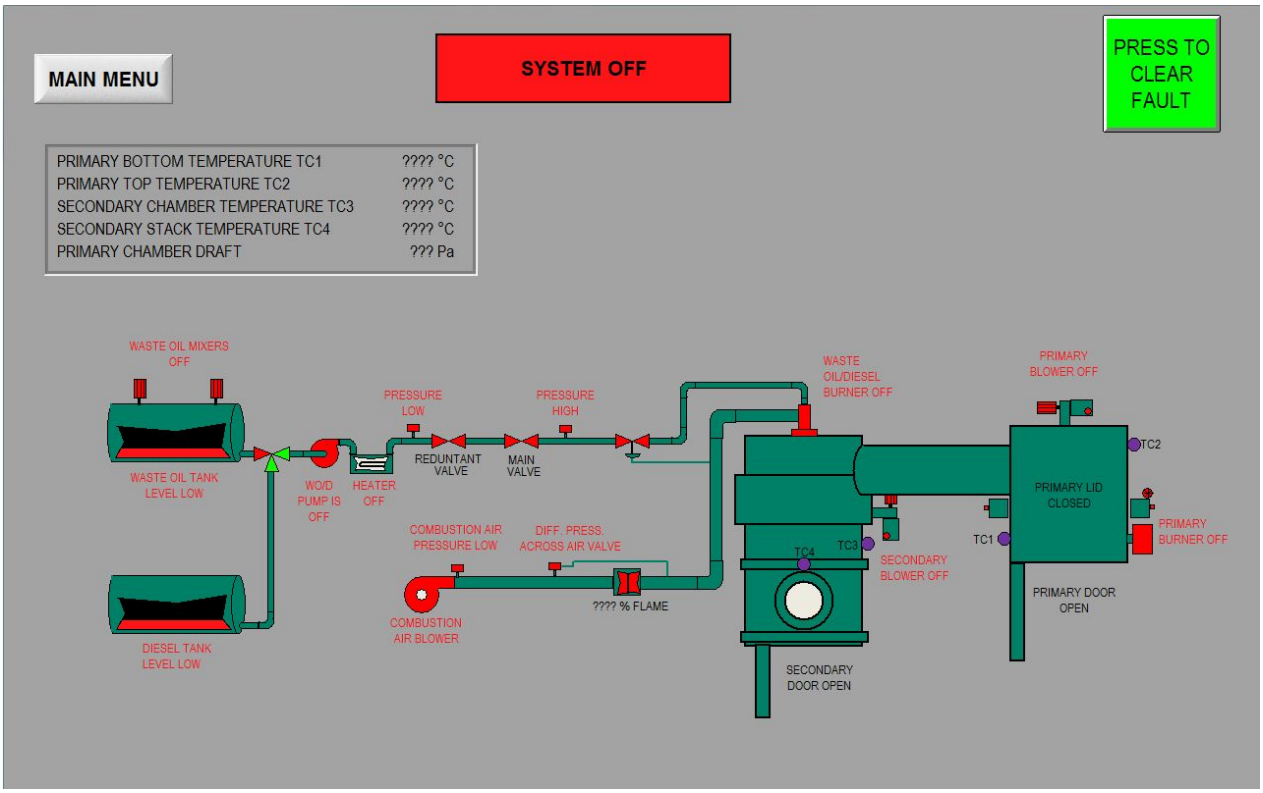
Top View

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

NOTE

The system will not start if there are alarms or faults present. Clear and/or acknowledge faults.

At any time, touch **Main Menu** to go back to the main screen.

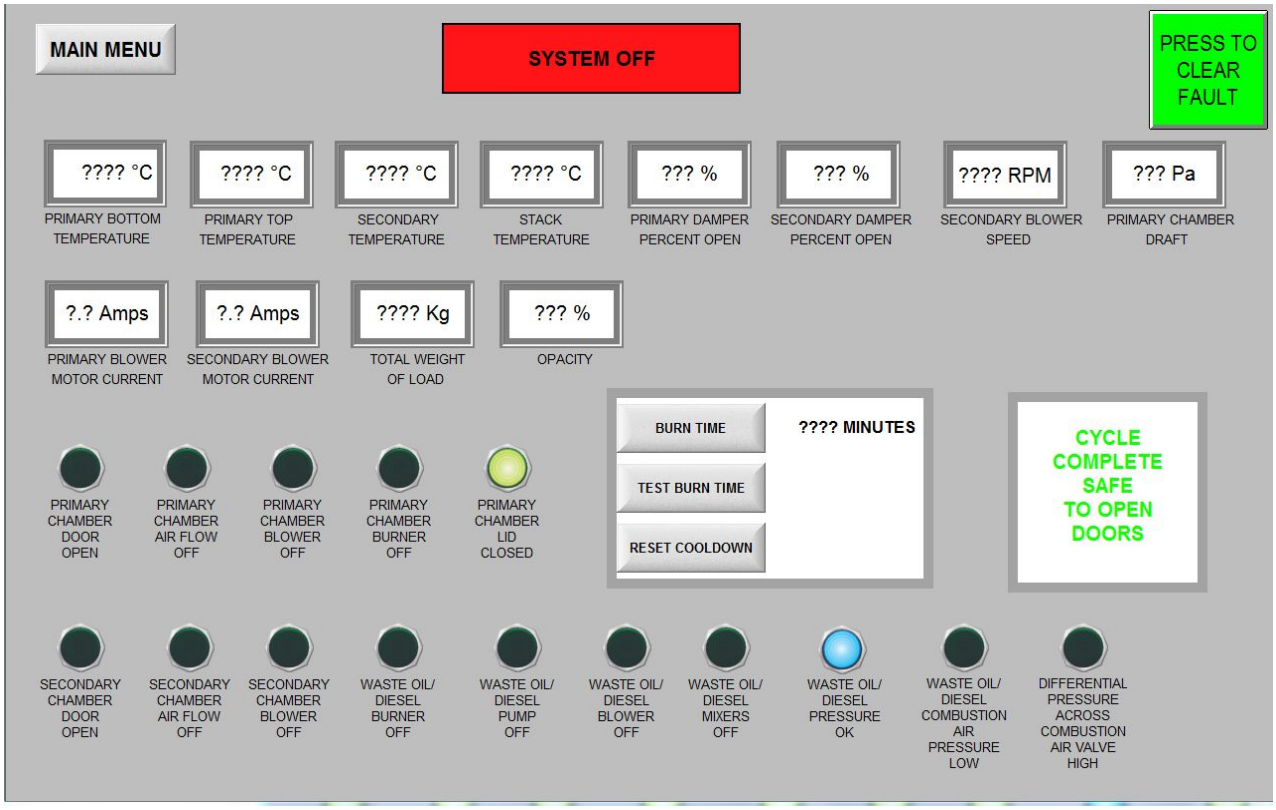


System Status

When the ***System Status*** button is selected from the **Main Menu,** a screen will display the status of all the operating parameters of the incinerator, such as the temperatures and the time remaining in the cycle, as well as displaying other informational items such as status of the door, lid lifter, 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 mixture; for example a very wet batch of garbage will take more time to burn than a dryer batch of waste.

At any time, touch **Main Menu** to go back to the main screen.



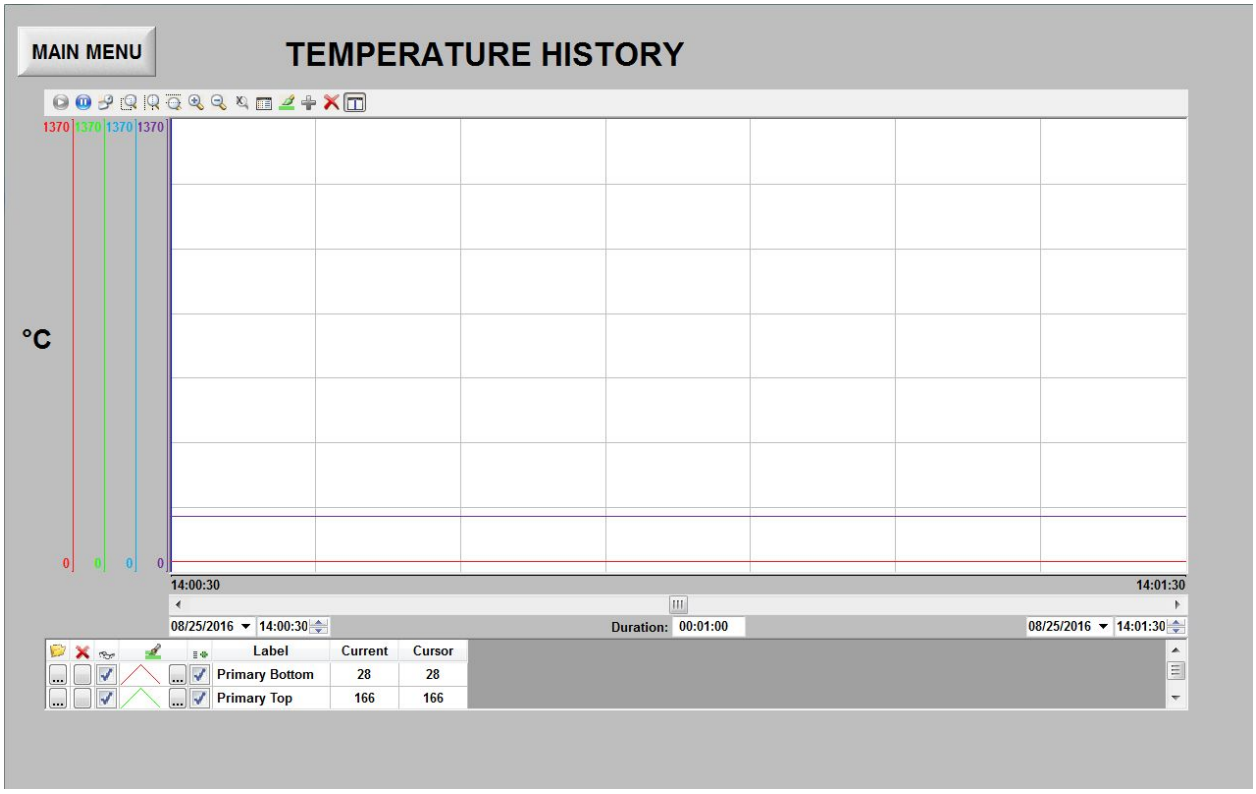
Overview of Historical Charts

The **Human Machine Interface (HMI)** monitors and records (every minute) critical operating parameters of the incinerator system like the temperature, motors, draft, load weights and alarms. Each operating parameter has its own graphic display for the operator to view, at any given time. Each display can easily be selected from the **Main Menu** of the **Human Machine Interface (HMI)**. The display will show the specific data collected from previous burn cycles.

This **Incinerator Data** is important for regulatory purposes and for general operating purposes. Also, the incinerator data is to be downloaded on a weekly basis to USB key for record-keeping purposes.

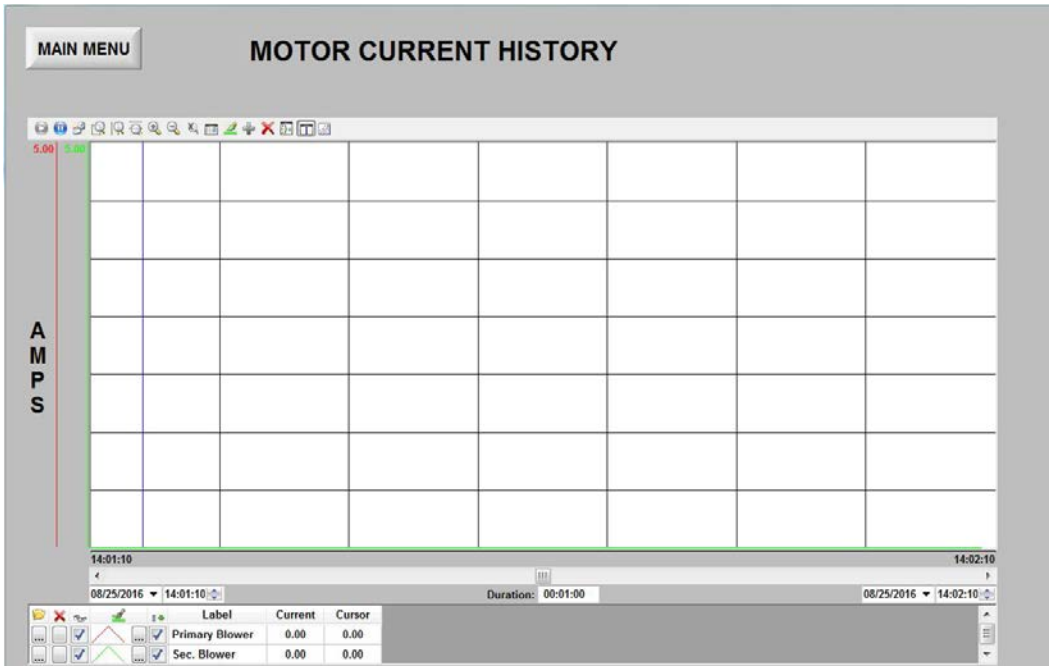
Temperature History

For example, when the ***Temperature History*** button is selected, the screen will display the trend in temperature during the operation of the system, include date & time of occurrence of that specific temperature.



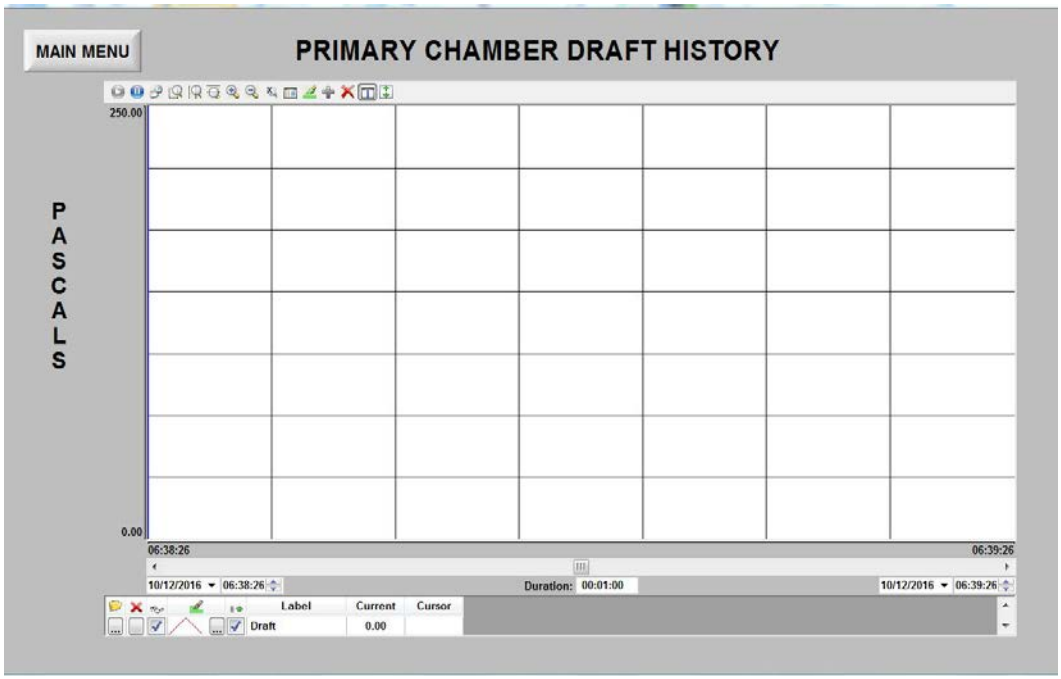
Motor Currents History

When the ***Motor Currents History*** is selected a screen will display the motor currents from the Primary Burner and the Secondary Burner, in AMPS, during the operation of the system, including date & time of occurrence of that specific motor current.



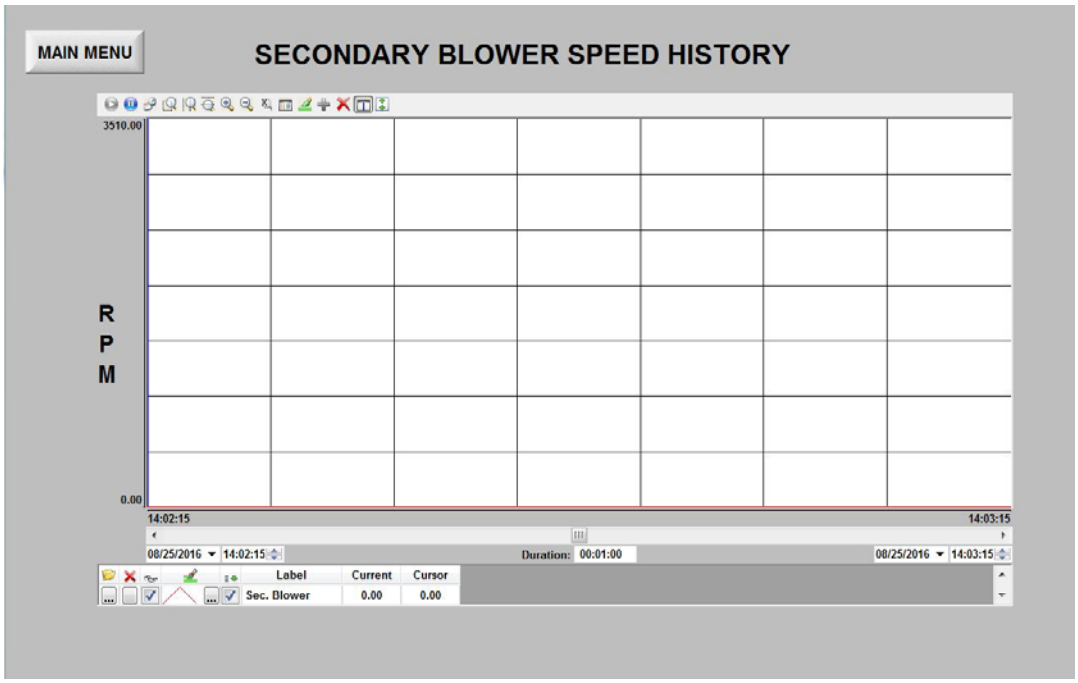
Draft History

When the ***Draft History*** button is selected a screen will display the draft during the operation of the system, include date & time of occurrence of that specific draft trend.



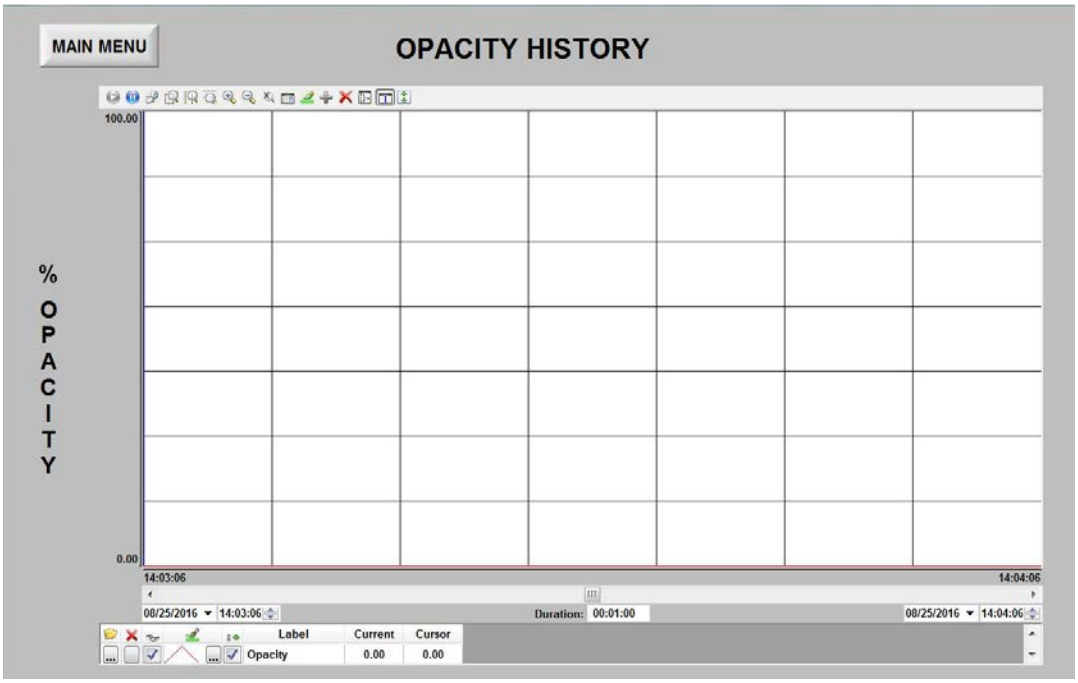
Secondary Blower Speed History

When the ***Secondary Blower Speed History*** button is selected a screen will display the RPM during the operation of the system, include date & time of occurrence of that specific speed.



Opacity History

When the ***Opacity History*** button is selected a screen will display the Opacity during the operation of the system, include date & time of occurrence of that specific reading.

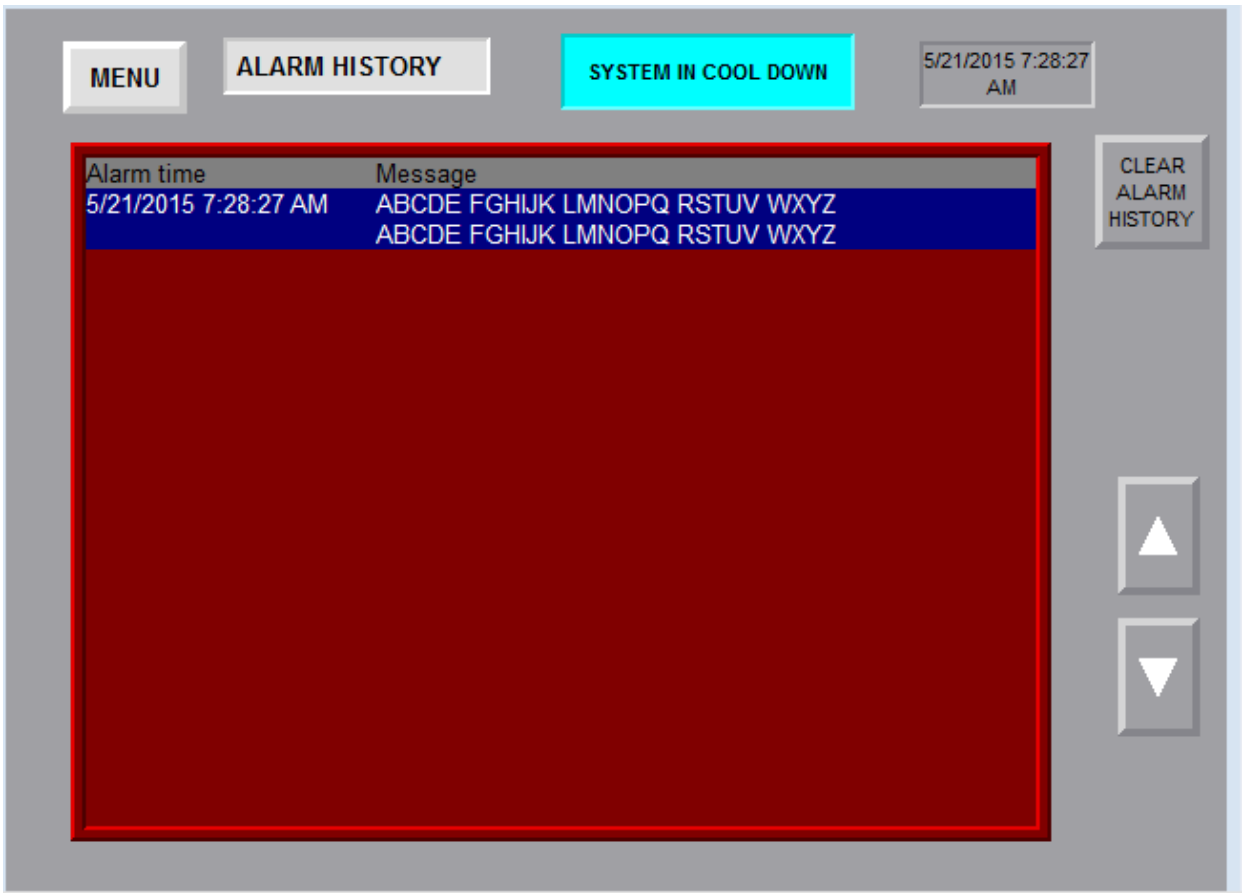


Alarm History

When the ***Alarm History*** button is selected a screen will display the last 128 faults with the date & time of occurrence.

The operator can press the *CLEAR ALARM HISTORY* to clear all of the faults, if they wish to. This does not affect the record-keeping feature of the system.

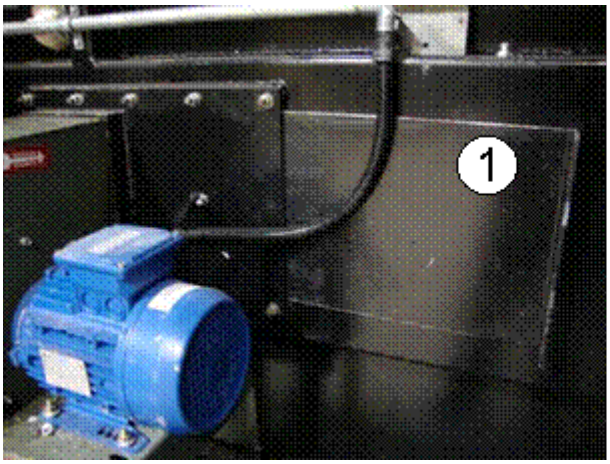
At any time, touch **Main Menu** to go back to the main screen.



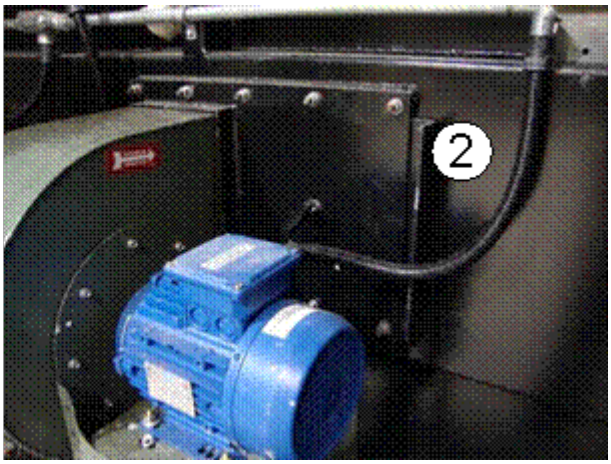
Standard Daily Operating Procedures

Incinerator Daily Start up

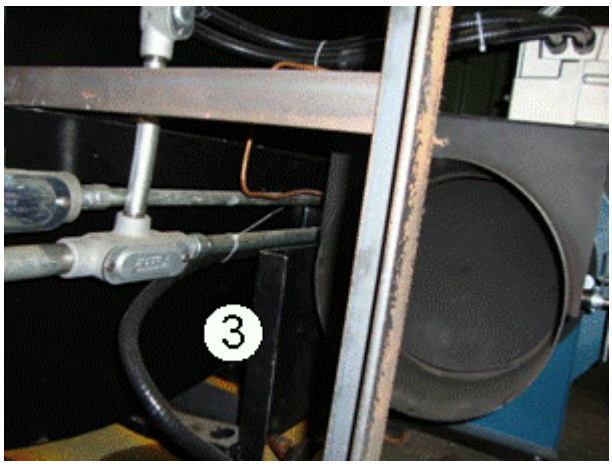
1. Ensure that manual slide gates for each blower are in the open position for free airflow into the **Primary and Secondary Chambers**.



1. **Primary Chamber Blower** Manual Slide Gate Open



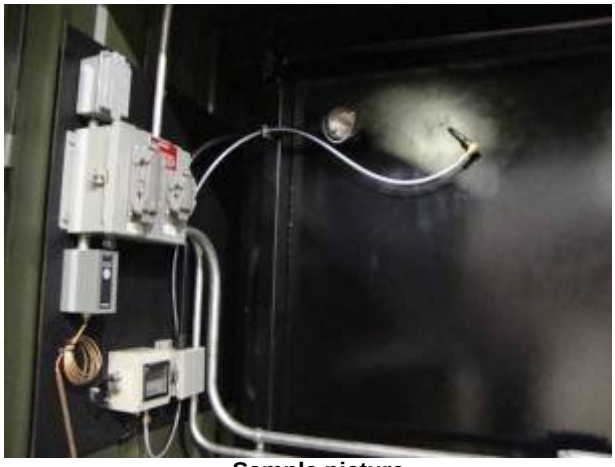
2. **Primary Chamber Blower** Manual Slide Gate Closed



3. **Secondary Chamber Blower** Manual Slide Gate Open

2. 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.

3. Ensure the draft gauge hose connection is tight and sealed. This is a clear flexible tubing located in the **Primary Chamber** (see photo below).



Sample picture

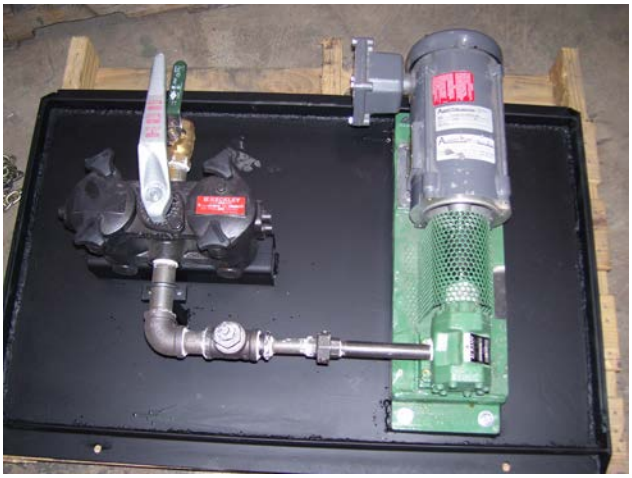
4. Unlatch all clamps on the **Primary Chamber** door, open and secure in the open position

5. Ensure the Primary Chamber floor is cool (less than 90°C). Remove all the ash from the previous burn and store ash is ash bins.
6. Lock the **Primary Chamber** Front Loading Door and ensure all latches are properly engaged.

If the floor is too hot the waste may spontaneously catch on fire during loading.

High Output dual Burner Secondary Chamber Start-up

SYSTEM CHECK



Filter & Pump.(sample image)

Do a walk around the Waste Oil System, ensuring that there are no leaks, all ball valves are in the proper and fully open position for either Diesel or Waste Oil according to the fuel to be used for this specific cycle

Ensure that the correspondent storage tank has enough fuel for the entire cycle.

Using Waste Oil: 800 L minimum of Waste Oil and 300 L minimum of Diesel (the Primary Chamber operated with Diesel only)

Using Diesel Only: 1100 L of Diesel minimum

Both the Waste Oil and Diesel Tanks require at least 150L stored at all time to keep the level sensor closed.

Clean the filter if necessary.

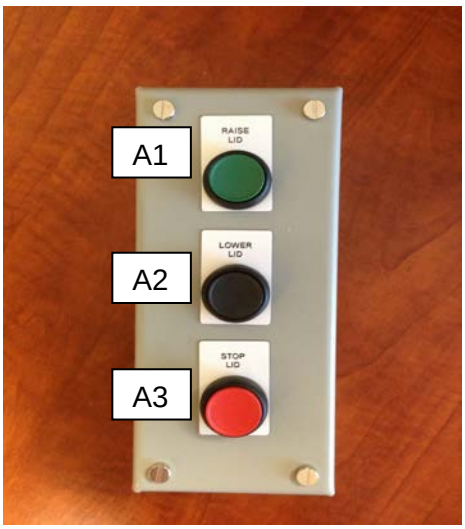
Check that all of the ball valves on the burner fuel oil train are fully open

Check that the Incinerator is not in cool down and the Primary temperature is 90°C or less.

Loading Procedure

Operator Stations for Lid Lifter

The Primary Chamber of the ECO 1.75TN 1PVC100L Waste Incinerator has a lid lifter to allow the roof of the chamber to be opened for quick loading of the waste.



Number	Name	Purpose
A1	**Raise Lid**	Raises the Lid on the Primary Chamber
A2	**Lower Lid**	Lowers the Lid on the Primary Chamber
A3	**Stop Lid**	Stops the lid during raising or lowering.

Once the roof is opened, the chamber can be loaded by the operator with the waste going to the incinerator.

Operating the Integrated Weigh Scale

1. The Operator has two options for managing the waste quantity prior to loading the selected Primary Chamber:

    i. Option 1: The operator will use the hoppers (previously tarred) to load waste onto the weigh scale.

    ii. Option 2: The operator may load waste/garbage (in bags/boxes) on the weigh scale directly.

2. Regardless of the option selected above, once the waste is on the weigh scale the Operator has to push the RECORD WEIGHT (black button) on the Weigh Scale Push-Button Station. By pressing this button, the weight value of that particular load of waste is sent to the PLC and the weight is recorded. At this time, the MAXIMUM WEIGHT (green button) will flash green once to show that the weight has been logged.

3. Then, the operator must take the waste and load it into the Primary Chamber. The hopper is to be raised just past the top edge of the Primary Chamber (using proper lifting equipment by others).

4. Once the hopper clears the edge of the Primary Chamber, the hopper's content can be dumped inside the chamber.

5. The empty hopper can now be pulled from the edge of the chamber and then lowered.

6. The operator returns to the weigh scale with some more waste and repeats Steps 2 to 6. This entire procedure is repeated until the maximum load weight for the Primary Chamber is reached. The PLC will indicate this to the operator when the MAXIMUM WEIGHT (green light) comes on and remains on. This indicates that the maximum weight permitted, in this case, the incinerator is designed for a maximum of 1,750Kg of waste material.

NOTE

No more waste should be loaded into the Primary Chamber after the load has reached the maximum weight.

7. The Primary Chamber is loaded, and the incinerator is ready to start.

Tips for loading: To decrease burn time and allow for more uniform burn.

a. Load the less dense waste first

b. Load dry waste first. Placing wet waste near the top of the Primary Chamber allows moisture to evaporate early in the cycle.

NOTE

Do not load waste greater than 90 Kg using the top loading system. This waste is to be loaded from the front of the unit. Loading waste over 90 Kg from the top will cause refractory floor to fracture.

NOTE

Do not throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTE

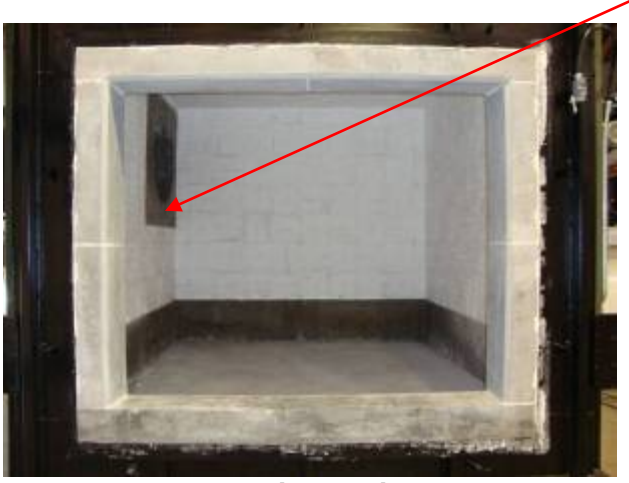
Load only the waste stream that the system has been designed for. DO NOT load a lot of high BTU rated waste for one burn (e.g. do not load more than three (3) gallons of bacon grease, kitchen grease or cooking oil). Doing so will result in excessive temperatures in the system reducing the life of the refractory.

NOTE

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

NOTE

Do not load the Primary Chamber such that the Breech and Burner section is blocked in any way.



Breech Opening

Burner port

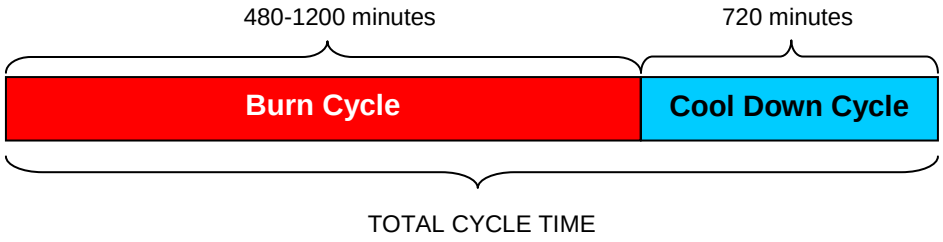
8. Inspect the lid ledge of the Primary Chamber and remove any debris that will prevent a tight seal with the lid.
9. Close the **Primary Chamber** lid by pressing the close button on the Lid Lifter Station. The lid will initially raise, after 0.5 seconds the safety pawls will pull out. Two seconds after sensing that the safety pawls are out the lid will lower.
10. The lid will keep lowering until either the down limit switch is activated or the stop button is pressed.
11. If the stop button was pushed just press the close button to resume lowering. The lid will raise then lower again. When the lid is stopped by either the lower limit switch or the stop button the safety pawls will be released back in.
12. Proceed to the **Main Control Panel.**

NOTE

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

NOTE

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



13. Check that the PRIMARY DOOR AND LID are closed on the **Human Machine Interface (HMI)** screens.
14. Check that no alarms are displayed on the **Human Machine Interface (HMI)**
15. Check that the EMERGENCY STOP BUTTON is out.
16. Check the GREEN CONTROL POWER BUTTON is lit up. Press this button to power on the control panel
17. On the **Main Control Panel turn the SELECTOR SWITCH** to the right to start the cycle. The following steps will automatically take place, controlled by the **Main 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** on both Primary Chambers will purge for safety and upon completion will ignite.

IV. The burn time will start counting down when the temperature in the **Primary Chamber** reaches 427°C.

NOTE

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

After the burn cycle is completed the system will enter the cool-down cycle when the following things will occur:

- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

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

Primary Chamber Clean Out Procedures

Operators responsible for loading and cleaning out incinerators should wear appropriate protective equipment, including eye protection, 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 should not be inhaled. The operator must wear dust protection safety gear.

Please follow these steps when the cycle is complete:

1. When the internal temperature of the **Primary Chamber** has cooled to less than 40°C, lock out the power to the system on the **Main Control Panel** by moving the main disconnect to the “OFF” position.
2. Unlock all door latches on the access door to the **Primary Chamber.**
3. While standing in front of the **Primary Chamber** door, slowly open the door to allow clear entry. Secure **Primary Chamber** Door in the OPEN position.
4. With the **Primary Chamber** Door secured in the open position, raise the lid to fully opened
5. Clean the **Primary Chamber** by using ash handling tool(s) and proper safety equipment (not provided).
6. Inspect the interior of the **Primary Chamber** for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
7. Check the air inlet holes and remove any obstructions if necessary.

8. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb.
9. Close the **Primary Chamber** access door by clamping each latch until it is tight.
10. 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.

In Case of Emergency

1. Go to 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 **Primary Chamber** out.
2. Check alarms to see what the problem is.
3. Do not open the door of the **Primary Chamber** unless the temperature inside the chamber is below 90^{o}C.
4. Call a certified technician to fix the problem and/or consult with **Eco Waste Solutions Customer Service Department at 905.634.7022, toll free 1-866-326-2876.**

Start Up After Power Failure

1. Once the power is restored turn breaker (main disconnect) back on.
2. The **Human Machine Interface (HMI)** and PLC will begin a boot up procedure.
3. Wait until the **Human Machine Interface (HMI)** on the **Main Control Panel** has booted up before turning the control power to the panel back on by pressing the Control Power ON button.
4. When the power is restored to the **Main Control Panel**, the button should illuminate.
5. If the system was interrupted during a burn cycle, restart the system by turning the selector switch on the main panel to the right to start the cycle . If the system was interrupted during cool-down cycle, it will resume the cycle where it left off.

Dealing with Warning and Faults

Troubleshooting

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

1. The system is in the “cool-down” part of the cycle. Wait until the “cool down” cycle is complete.

2. There is a fault in the system as indicated on the **HMI**

3. Loss of power due to any one or more of the following:

    - 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.

Power is OFF in this position

Power is ON in this position

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

- 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.

4. If on the Main Control Panel HMI the **Primary Chamber** 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.

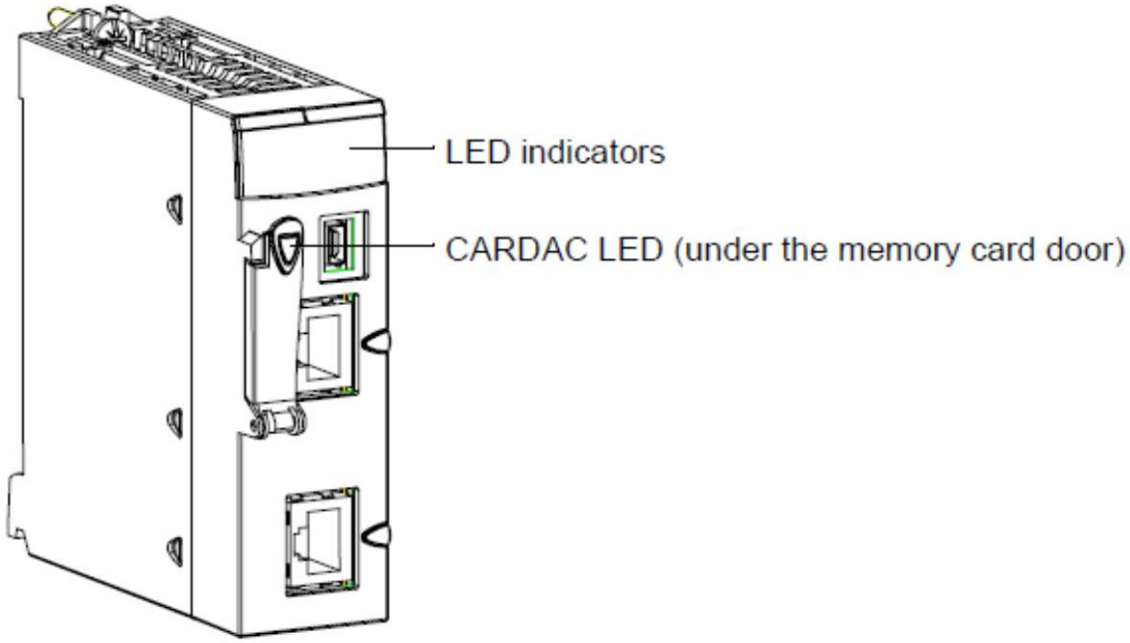
5. If on the Main Control Panel HMI the **Primary Chamber** roof lid is not closed, the lid has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

6. If on the Main Control Panel HMI the **Secondary Chamber** 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.

7. 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.

PLC Processor Problem

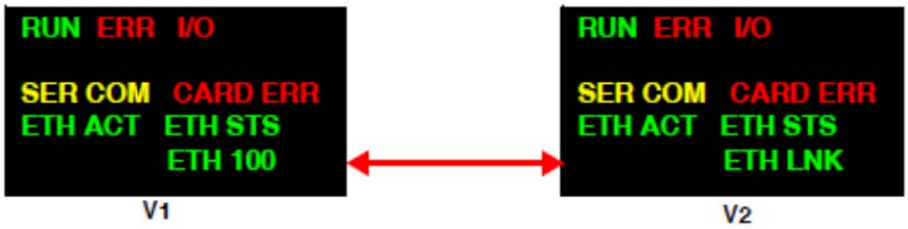
There are several LEDs available on the front panel of each Modicon M340 module or processor, enabling rapid diagnosis of the PLC status:



These LEDs provide information on:
- PLC functioning
- the memory card
- communication with the modules
- serial communication
- communication on the CANopen network
- communication on the Ethernet network

The following diagram shows the diagnostic LEDs on the BMX P34 2020 processor. Note that two displays exist, depending on whether you are using firmware V1 or V2

(or greater) of the processor.



The colors and blink patterns of the LEDs indicate the status and operating conditions of Ethernet communications on the module:

Label	Pattern	Indication
RUN (green): operational state	on	• PLC hardware and PLC program operations are normal. • Module is in RUN state.
	flashing	• PLC is in STOP mode or a blocking error in the application has been detected. • Processor is configured but not in RUN state.
	off	PLC is not configured (application is absent, invalid, or incompatible).
ERR (red): detected error	on	Processor, system, or configuration detected error
	flashing	• PLC is not configured (application is absent, invalid, or incompatible). • PLC is in STOP mode or a blocking error in the application has been detected.
	off	Normal (no detected errors)
ETH STS (green): Ethernet communication status	on	Communication OK
	2 flashes	Invalid MAC address
	3 flashes	Link not connected
	4 flashes	Duplicate IP address
	5 flashes	Waiting for a server IP address
	6 flashes	Secure and safe mode (with default IP address)
	7 flashes	Configuration conflict between rotary switches and internal configuration
CARDERR (red): memory card detected error	on	• Memory card is missing. • Memory card not usable (bad format, unrecognized type). • Memory card content is inconsistent with internal RAM application.
	off	• Memory card is valid and recognized. • Application on card is consistent with the internal RAM application.
I/O (red): input/output status	on	• Error detected on a configured module or CPU channel • Configuration mismatch with the application (module missing...)
	off	Normal (no detected errors)

SER COM (yellow): serial data status	flashing	Data exchange (send/receive) on the serial connection in progress
	off	No data exchange on the serial connection
CAN RUN (green): CANopen operations	on	CANopen network operational
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN ERR).
	slow flashing (note 2)	CANopen network is pre-operational.
	1 flash	CANopen network is stopped.
	3 flashes	Downloading CANopen firmware.
CAN ERR (red): CANopen detected error	on	CANopen bus is stopped.
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN RUN).
	slow flashing (note 2)	CANopen configuration is not valid.
	1 flash	At least one error counter has reached or exceeded alert level.
	2 flashes	A guard event (NMT slave or NMT master) or a heartbeat event has occurred.
	3 flashes	The SYNC message was not received before the end of the communication cycle period.
	off	No error detected on CANopen.
CARDAC (green): memory card access **Note:** This LED is located under the memory card door (see *The Module, p. 20*).	on	Access to the card is enabled.
	flashing	Activity on the card: during each access, the card LED is set to OFF, then back to ON.
	off	Access to the card is disabled. You can remove the card after you disable card access by setting system bit %S65 to 0.
Note 1: Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.		

Note 2: Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

The following table describes the meaning of the ETH ACT and ETH 100 LEDs on the front panel for firmware V1 NOE and CPU modules.

Label	**Pattern**	**Indication**
ETH ACT (green): Ethernet communication (transmission/ reception activity)	on	Ethernet link detected: no communications activity.
	off	No Ethernet link detected.
	flashing	Ethernet link detected: receiving or sending packets.
ETH 100 (green): Ethernet transmission speed	on	Ethernet transmission at 100 Mbit/s (Fast Ethernet).
	off	Ethernet transmission at 10 Mbit/s (Ethernet) or no link detected.

The following table describes the meaning of the ETH ACT and ETH LNK LEDs on the front panel for firmware V2 NOE and CPU modules.

Label	Pattern	Indication
ETH ACT (green): Ethernet communication (transmission/ reception) activity	on	Communications activity detected.
	off	No communications activity detected.
ETH LNK (green): Ethernet link status	on	Ethernet link detected.
	off	No Ethernet link detected.

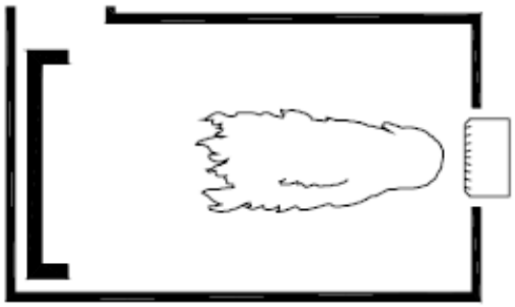
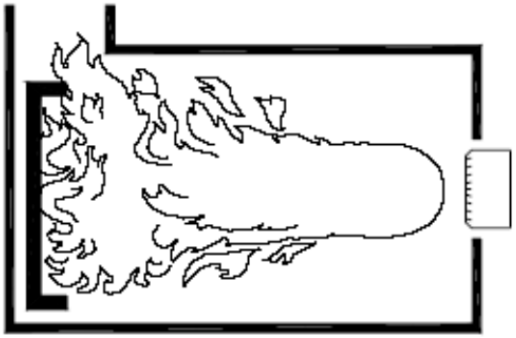
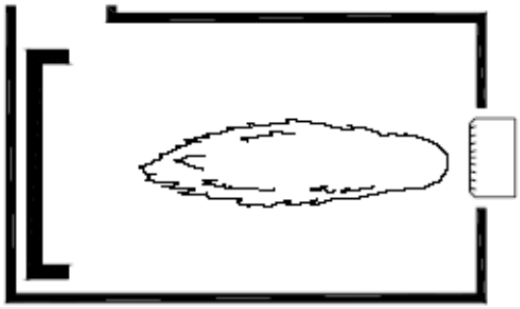
Note:

- Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.
- Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

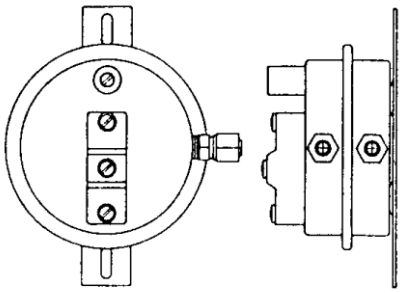
Possible Problems, Causes and Solutions

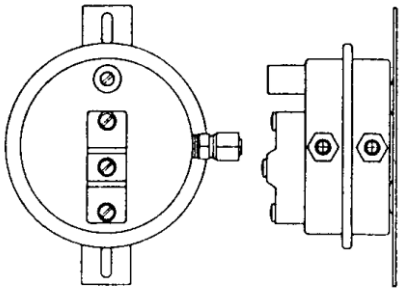
Problem	Causes	Solutions
Blower Fails to start	Over load tripped, blown fuse	Turn power off. Open Panel and reset overload. Check fuse and replace.
	Motor starters or contactor coil is burnt out	Locate contactor for Blower and visually observe if the contactor is pulled in. Use a volt meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor.
Secondary Burner won't ignite	Bad Electrodes	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 10.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact Burner alarm has been tripped	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple .
Primary Burner won't ignite	Bad Electrode	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 8.
	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.
	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.

Problem	Causes	Solutions
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.
	Secondary Chamber is not hot enough.	Too much draft, open barometric damper.
	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.
	Operating at a too high 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 to ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value.
	Low draft	Close barometric damper on stack's T-section
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.

Problem	Causes	Solutions
		Correct Maximum Flame Adjustment (Proper Oil and Air Pressure with correct supply of combustion air)
		Incorrect Flame Adjustment (Not enough Combustion Air)
		Incorrect Flame Adjustment (Air Pressure too high; too much air)
Incomplete burnout/poor ash quality	Build-up around air holes – clogged with ash from previous burn	Check around air holes and clean.
	Poor draft	Draft should be -0.2-0.06 KPa (or 0.8-0.25“ W.C).
	Too much wet waste – overloading system	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Insufficient burn time	Allow longer burn time period.

Possible Alarms (Faults)

#	ALARM (System Fault)	SOLUTION
1	The Primary Chamber top/bottom thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
2	The Secondary Chamber thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
3	The Secondary Stack Thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
4	The primary burner is faulted	The primary burner has failed to light when it received a signal to start. To reset the burner, press the reset button located on the Burner. If this does not start the burner, refer to Supplier Catalogue (Riello Burner) in Section 8
5	The secondary burner is faulted	The secondary burner has failed to light when it received a signal to start. To reset the burner,
6	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. Refer to Section 6 of this manual. There are two ports on the air flow 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. Refer to Section 6 of this manual.
7	The primary blower motor overload is tripped.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.

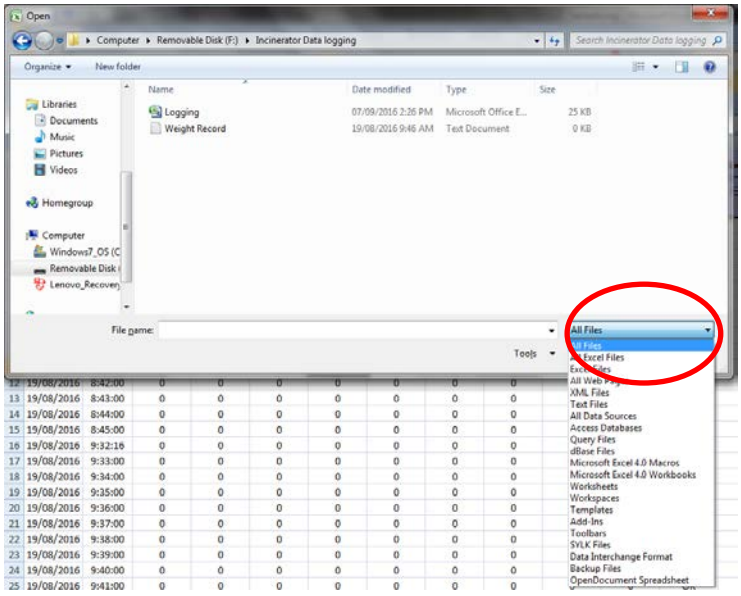
#	ALARM (System Fault)	SOLUTION
8	The system has shut down due to secondary blower low air flow 	Visually examine the Secondary Blower for any obstructions that may be causing low air flow. . Check slide gate located between Secondary chamber and blower, ensure it is open. Check damper assembly, ensuring Modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air flow switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow 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. Refer to Section 6 of this manual.
9	The Secondary blower variable frequency drive is faulted	Push fault reset button on the HMI If fault persist check the error code on the variable frequency drive and check manual for troubleshooting alarm.
10	The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself. If alarm persists, replace the low level switch.
11	Primary Chamber – lid lifter hydraulic pump overload.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.
12	Primary Chamber – lid lifter stuck while rising.	Check to see if anything is blocking the lifts or roof from raising Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working

#	ALARM (System Fault)	SOLUTION
13	Primary Chamber - lid lifter stuck while lowering.	Check to see if anything is blocking the lifts or roof from lowering Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working This can be caused by a burnt out solenoid valve. Check that the control valve is open.
14	Primary Chamber - lid lifter left or right safety pawl failed to retract.	Check the proximity switch that senses that the safety catch is out Check the solenoid valves (located on each column)

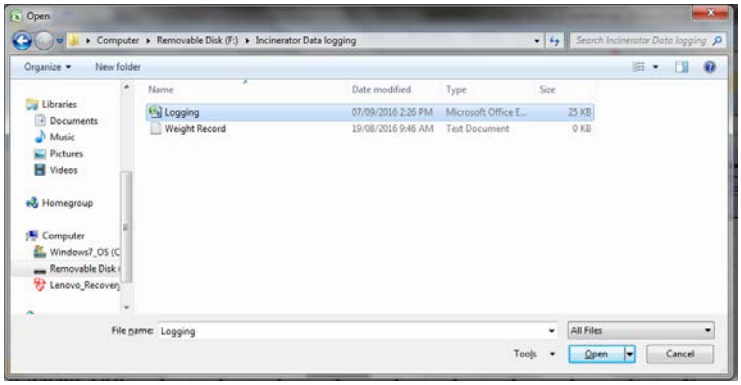
Record Keeping

Accessing Historical Information

1. It is recommended that a dedicated folder be set on the destination computer that is used for storing data from the Incinerator Package (e.g. “Incinerator Data”)
2. Turn power off to the Main Control panel by turning the Main Disconnect to the OFF position.
3. Open the Main Control Panel door and remove the USB from the back of the HMI panel and insert the USB into the destination computer.
4. Open an Excel File, once opened go to File/Open locate the USB on your computer, in the bottom right corner choose “All Files”.

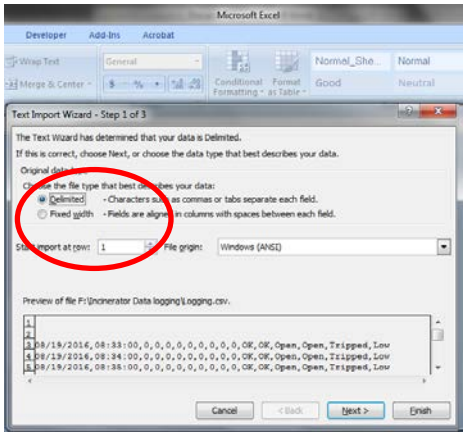


5. Click on the “logging” file and press open.

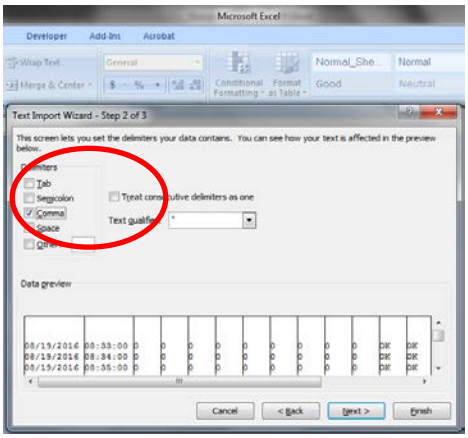


6. Excel will prompt you with a text import wizard, follow the next 3 steps to ensure the log files is displayed properly:

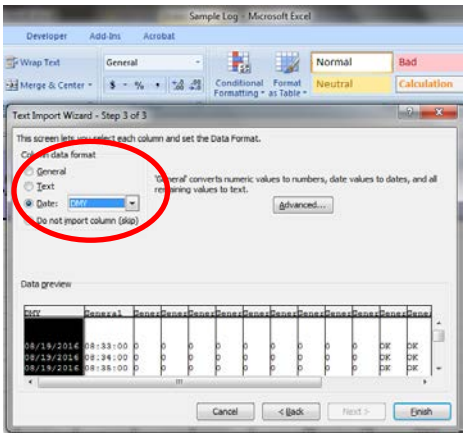
7. Steps 1 of 3 choose delimited – character such as commas or tabs separate each field, and choose Next:



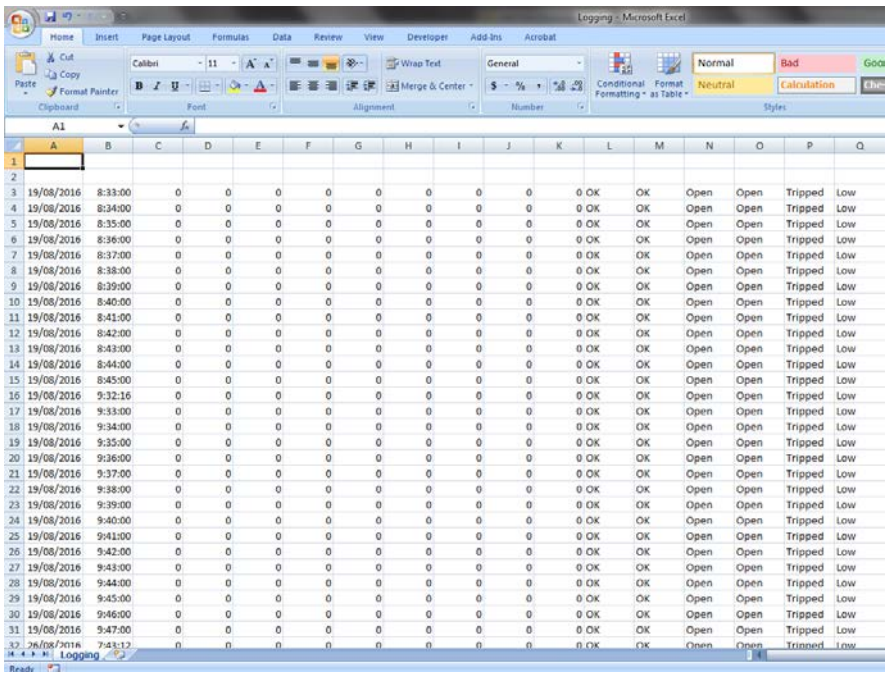
8. Steps 2 of 3 choose Comma as the delimiting item, and choose Next:



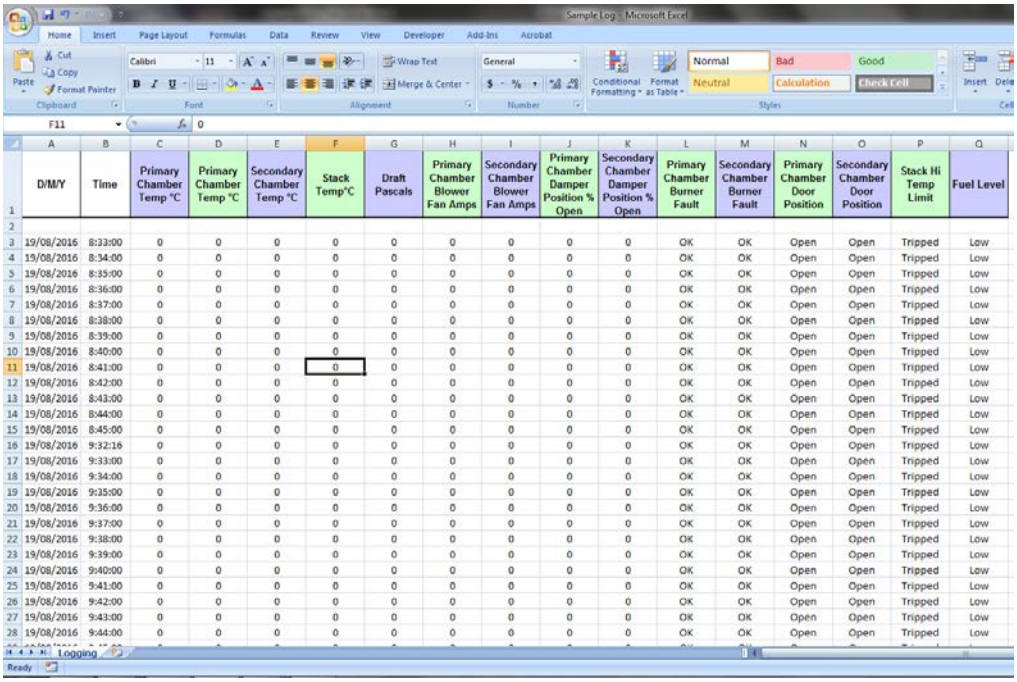
9. Steps 3 of 3 Column data format should be Date with DMY – character such as commas or tabs separate each field, choose Finish.



10. Once the data is open, it will look similar to the following:



11. From the electronic template file located on the USB for the manual copy the first row and paste into your log file:



	D/M/Y	Time	Primary Chamber Temp °C	Primary Chamber Temp °C	Secondary Chamber Temp °C	Stack Temp°C	Draft Pascals	Primary Chamber Blower Fan Amps	Secondary Chamber Blower Fan Amps	Primary Chamber Damper Position % Open	Secondary Chamber Damper Position % Open	Primary Chamber Burner Fault	Secondary Chamber Burner Fault	Primary Chamber Door Position	Secondary Chamber Door Position	Stack Hi Temp Limit	Fuel Level
1																	
2																	
3	19/08/2016	8:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
4	19/08/2016	8:34:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
5	19/08/2016	8:35:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
6	19/08/2016	8:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
7	19/08/2016	8:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
8	19/08/2016	8:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
9	19/08/2016	8:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
10	19/08/2016	8:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
11	19/08/2016	8:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
12	19/08/2016	8:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
13	19/08/2016	8:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
14	19/08/2016	8:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
15	19/08/2016	8:45:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
16	19/08/2016	9:32:16	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
17	19/08/2016	9:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
18	19/08/2016	9:34:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
19	19/08/2016	9:35:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
20	19/08/2016	9:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
21	19/08/2016	9:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
22	19/08/2016	9:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
23	19/08/2016	9:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
24	19/08/2016	9:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
25	19/08/2016	9:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
26	19/08/2016	9:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
27	19/08/2016	9:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
28	19/08/2016	9:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low

12. Save your excel file with the date in the designated folder.

13. Reinstall the USB to the back of the HMI, close the Main Control Panel door and turn power back on to the system.

SECTION 6

MAINTENANCE INSTRUCTIONS

Zero Mechanical State & Lock Out Procedures

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS Incinerator.

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

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 Procedures

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 procedures in this *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

Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is absolutely 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 pressure 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 procedures at site should require ZMS condition as a matter of course.

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.

Power Lock Out Procedures

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 to electricity, strict discipline and constant supervision should be employed during any equipment maintenance work.

Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine or motor, line shaft or other power transmission equipment or power-driven machine, make sure it can not 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 finished working at the end of your shift 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

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
Refractory	05-001
Air Compressor	03-001
Thermocouple	05-002
Main Control Panel	03-010
Paint	05-003
Electrical	05-004
Limit Switch	05-005
Lid Lifters	06-001

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**, 01-001.Q.01** Primary blower assembly quarterly instruction number 1.

i. Daily Instructions

Primary Chamber Burner: (01-002.D)

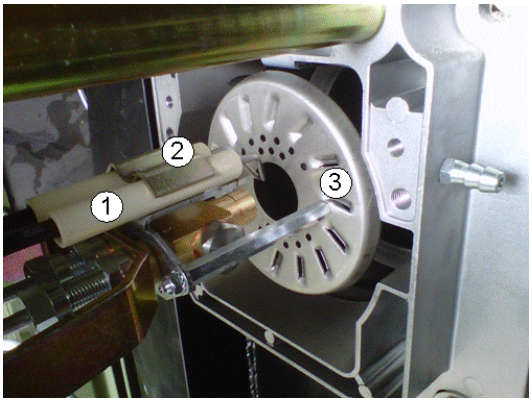
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

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

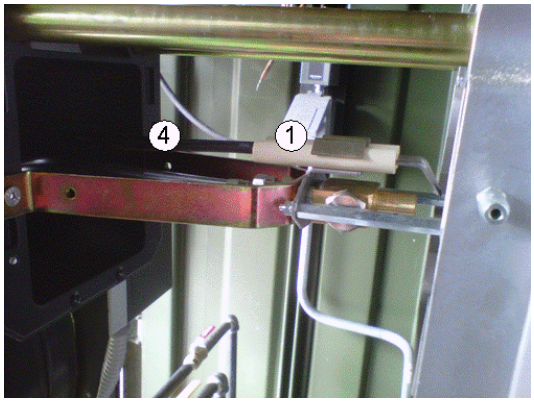
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01-002.D.01: INSPECTING AND CLEANING ELECTRODES

1. Remove the cover from the Burners as described in 01-002.W.01
2. Inspect the electrodes (PN: 3003796) for any soot build-up.



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

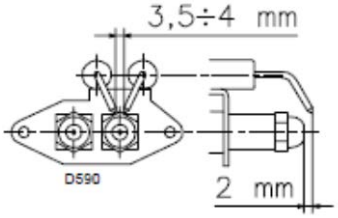


4. HT Leads

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

NOTE 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.



Primary Burner

Check the High Temperature (HT) Leads (PN: 3012995) for any heat damage. If HT Leads are severely damaged (ie, you can see the wire beneath the sheathing) then replace. (See *CMI 6.3.3/01-002A)*

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

1. Visually inspect all fuel lines to the Primary and Secondary Burner for any leaks.
2. The Primary Burner have two oil lines, one feed and one return. the Secondary Burner has only a feed line
3. If any leaks are observed tighten or replace the fitting where the leak is occurring

INSTRUCTION 01-002.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 (PN: C5222433)

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 6.1 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 (PN: 1" x 24" 8# 2600) or new module (PN: 6" Mod ZR) (*CMI 6.3.2/05-001A & 6.3.2/05-001B)*

ii. 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 6.1 Zero Mechanical State & Lock Out Instructions.*

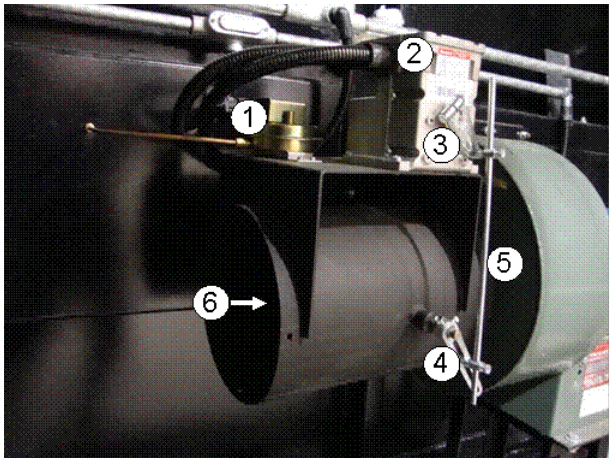
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

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

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

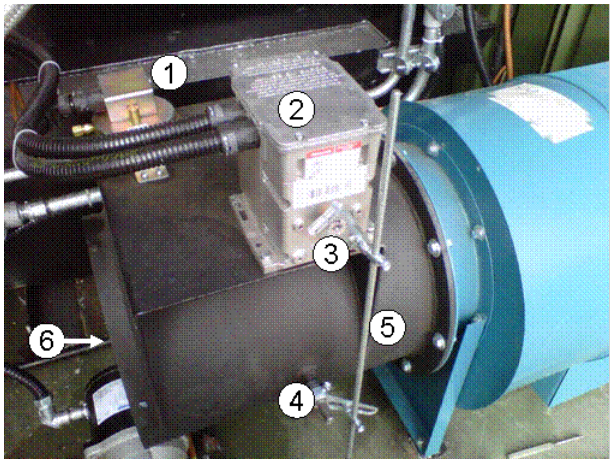
Check to see that the damper crank arm is connected to the damper and the rod.

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



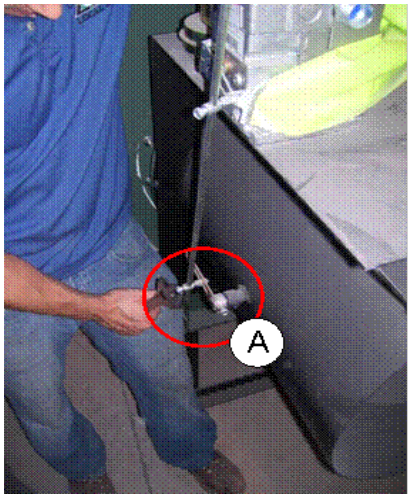
PRIMARY BLOWER

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



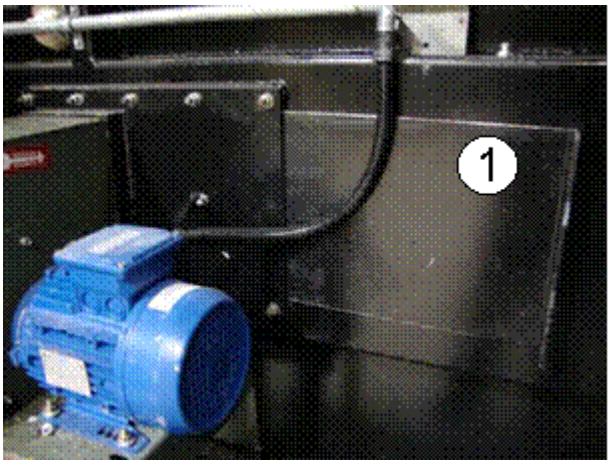
A. Damper Crank arm and connection to Damper and Rod

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

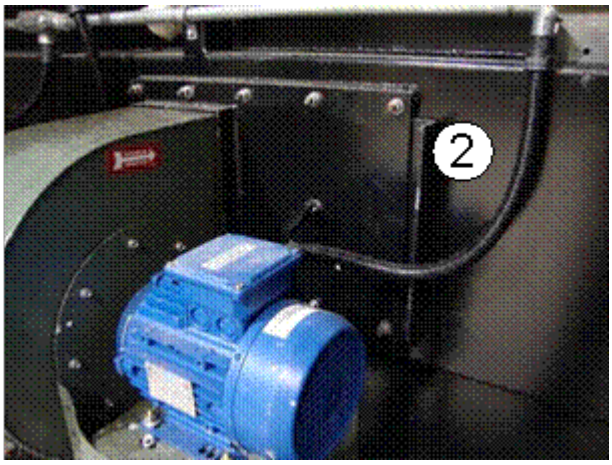
Check to see if slide gates move freely.

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.

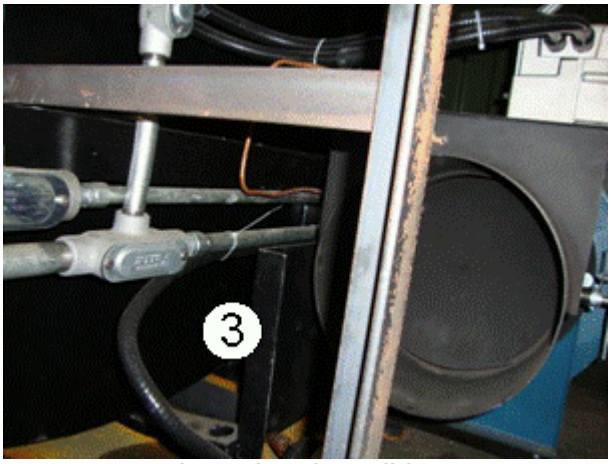
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary Chamber Burner: (01-002.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/-002.W.01: REMOVAL OF BURNER COVER

Switch off the electrical power. Please follow all instructions in *Section 6.1 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on the burner.

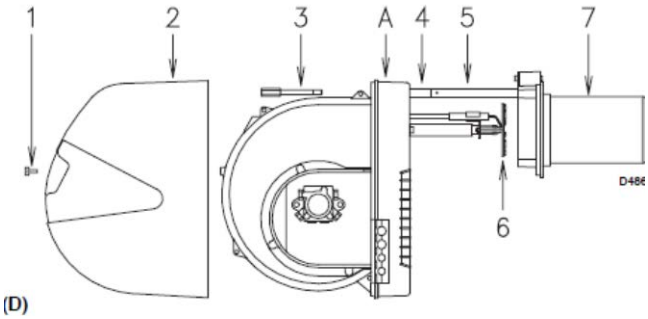
To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

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

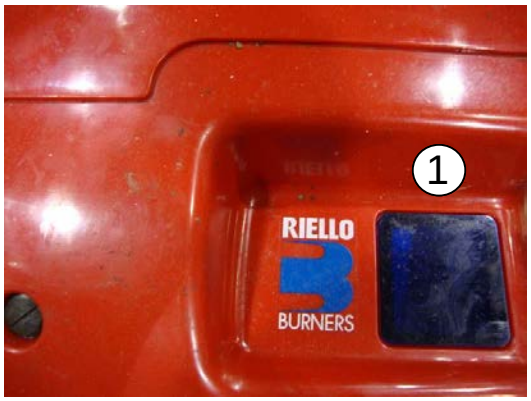
INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO ELECTRIC CELL

1. Remove the cover from the Burners as described in Instruction 01-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth (Primary Burner PN: 3006216)
3. P.E. cell (Item #1) 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. Replace burner cover.

Primary Burner PE Cell

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

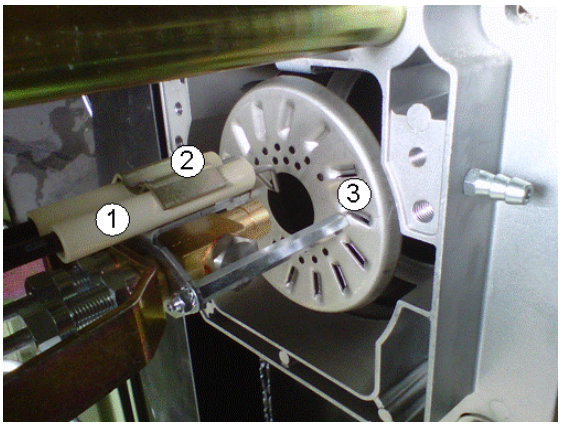
Clean the inspection windows with a wet cloth.



1. Primary Burner Inspection Window

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

1. Remove the cover from the Burners as described in 01-002.W.01.
2. Check the diffuser disc assembly (Primary Burner PN: 3003791) for any heat damage
3. If any heat damage, deformation or excess rust is noted, replace. (*CMI 6.3.8/03-009K)*



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

Secondary Chamber High Output Dual Burner: (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 02-002.W.01: SECONDARY BURNER WEEEKLY ROUTINE

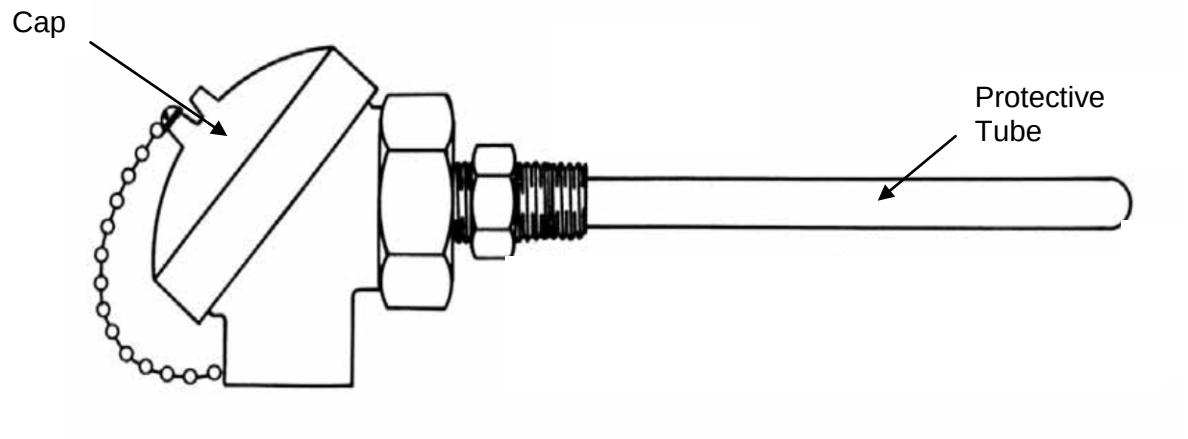
1. Clean flame sensors.
2. Clean the glass on the flame inspection window.
3. Clean spark ignitors.
4. Clean pilot assemblies.
5. Check spark ignitor lead connections.
6. Check turbulator ring.
7. Clean all filters and filter screens.
8. Lubricate all moving parts (i.e. bearings on doors, door latches & hinges, air and fuel valves, proportioning fuel valves, particularly the shafts on both air modulation valves

9. Check all motors for bearing noise, loose fans, etc.

10. Inspect fuel lines for leaks

Thermocouple: (05-002.W)

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

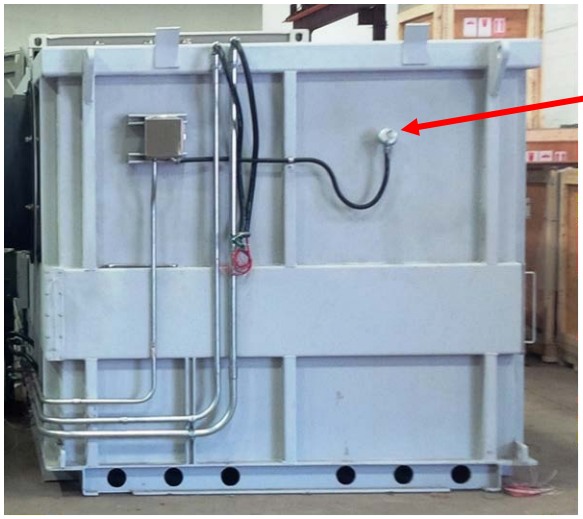


Thermocouple Assembly

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 *CMI 6.3.1/05-002A*



1. Primary Chamber #1 Thermocouple

2. Two Secondary Thermocouples on Secondary Chamber body and beside the burner

3. Stack Thermocouple on Stack

i. 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 6.1 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 Chamber Burner: (01-002.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 01-002.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 *CMI 6.3.3/01-002F & 6.3.3/02-0002F*

Primary Chamber Burner Flexible lines

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

1. Remove the cover from the Burner 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.

Primary 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.

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 01-002.M.03: CLEAN BURNER OF DUST

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

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

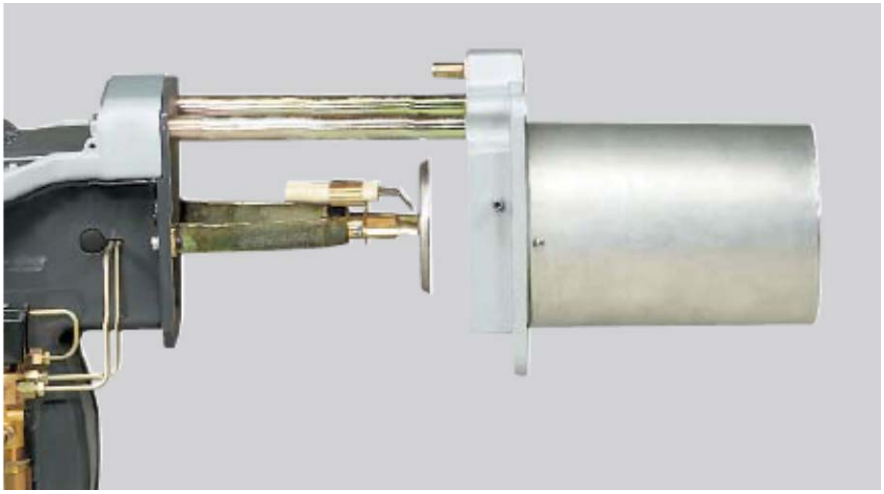
3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

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

1. Remove the cover from the Burners as described in Instruction 01-002.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 *CMI 6.3.3/01-002D & 6.3.3/02-002D*

Secondary Chamber High Output Dual Burner: (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 02-002.M.01: SECONDARY BURNER IN-LINE HEATER

1. Check all electrical connections.
2. Remove heater element from casing and inspect for build-up. Clean any deposits. When reinstalling always ensure the bundle will be restarted immersed. **NEVER** use the inline oil heater dry.

INSTRUCTION 02-002.M.02: SECONDARY BURNER SOLENOID VALVES

1. Examine solenoid valves for any deposits. Remove if necessary
2. Check electrical connections.

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 6.1 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 *CMI 6.3.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *CMI 6.3.2/05-001A & 6.3.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.
8. From Secondary Chamber interior look up the stack while the cap is in closed position.
9. View the surface of the bottom of the stack cap flap with a flash light
10. Some cracking is normal, however if pieces are missing or have fallen out, (See *CMI 6.3.2/05-001E)*

Lid Lifters: (06-001.M)

 **Controls are normally closed. Do not modify to by-pass or leave the controls open.**

Always remain vigilant and avoid injury.

INSTRUCTION 06-001.M.01: CHECK HYDRAULIC FLUID

Check the level of the hydraulic fluid. Fill if necessary.

1. Always use High temperature hydraulic oil Grade 32 to fill the tank.

ii. Quarterly Instructions

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

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 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.Q.01: LUBRICATE BEARINGS

1. Lubricate the bearings, but do not over lubricate.

2. Bearings are completely filled with grease at the factory; they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F and grease may bleed from the bearing seals. This is normal and no attempt should be made to replace lost grease. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level.

3. Bearings should be lubricated with premium quality lithium-based grease conforming to NLGI Grade 2. Examples are:

   Mobil - Mobilgrease XHP
   Texaco - Premium RB
   Chevron - Amolith #2
   Shell - Alvania #2

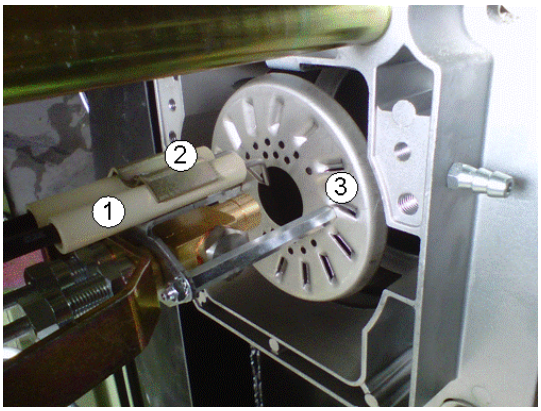
4. Add grease to the bearing via the grease nipple while running the fan or rotating the shaft by hand. Be sure all guards are in place if lubrication is performed while the fan is operating. Add just enough grease to cause a slight purging at the seals. Do not over lubricate.

Primary Chamber Burner: (01-002.Q)

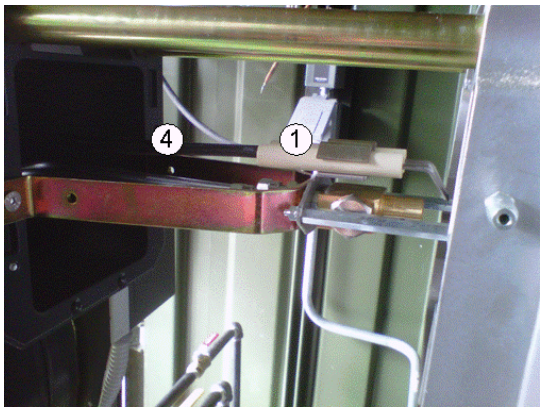
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01-002.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 Leads (PN: 3012995 Primary). *See CMI 6.3.3/01.002A.*
    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

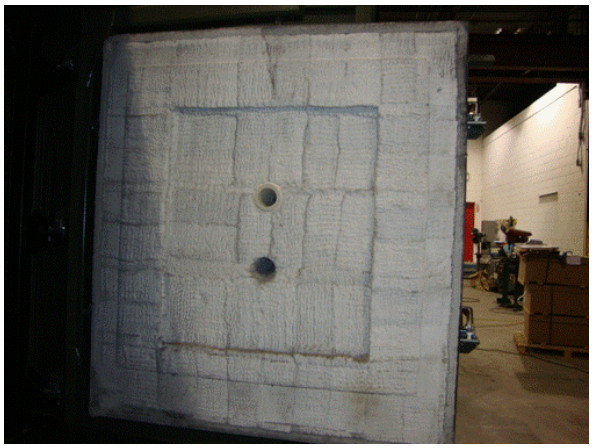
Refractory: (05-001.Q)

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 6.1 Zero Mechanical State & Lock Out Instructions.*

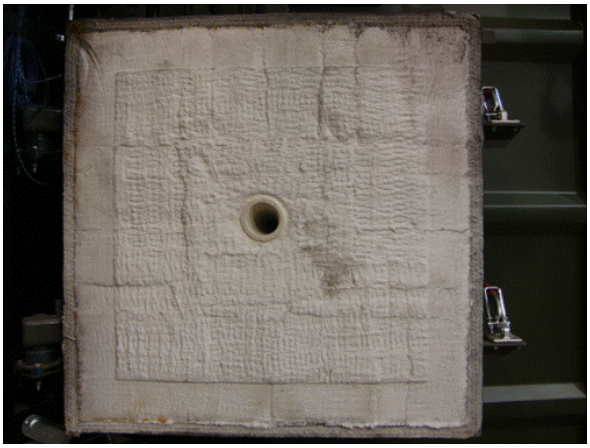
INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

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 (PN: GSB 1.5") if necessary. Cut out the damaged section and replace with new door gasket. See *CMI 6.3.2/05-001C*.
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).

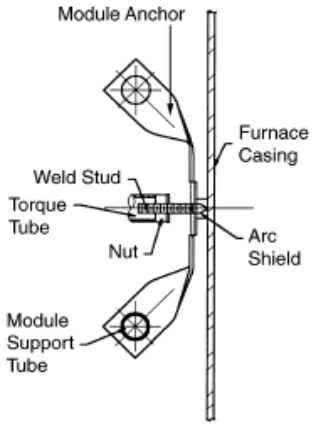


Figure 1: Side view of the Weld Loc Module

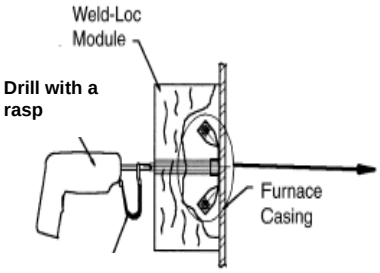


Figure 2: Stud Gun with rasp and Torque Tube.

A. **INSTALLATION**: Once the new module (PN: 433026) is in place take the stud gun (PN: ECO-STUD) with rasp to the Torque Tube and drill into place.

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

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.

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

iii. Yearly Instructions

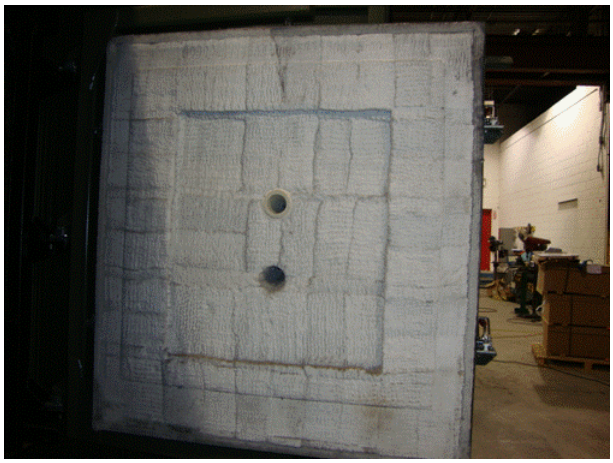
Refractory: (05-001.Y)

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

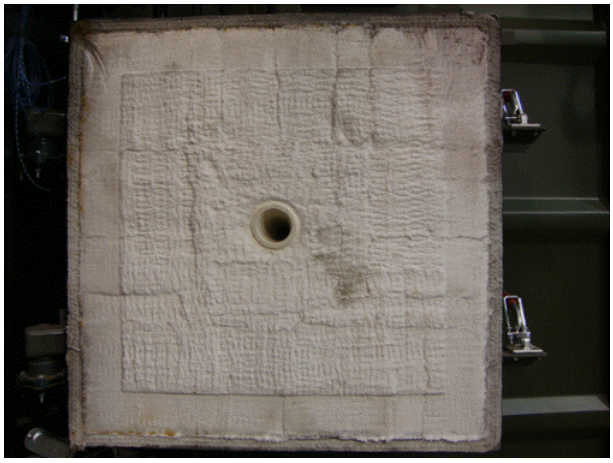
1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

2. Remove the damaged section of door gasket from door and reinstall new gasket (PN: GSB 1.5")



Primary Door (refractory lined)

Primary Door Gasket



Secondary Door (refractory lined)

Secondary Door Gasket

Electrical: (05-004.Y)

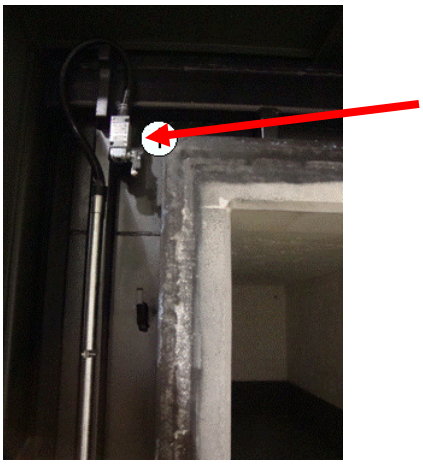
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

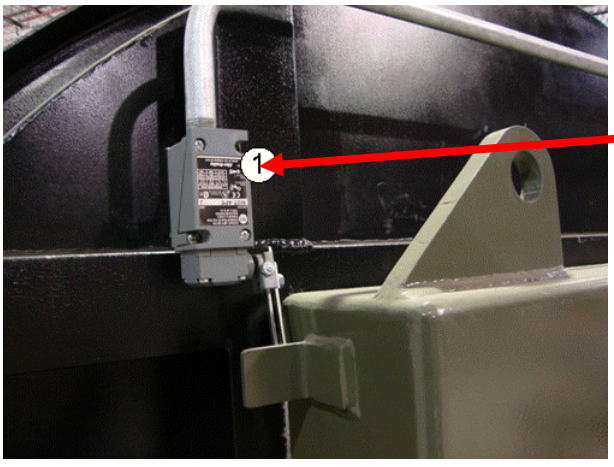
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

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 to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI to ensure that it indicates door is open.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches (PN: 802T-APE) if necessary.



Primary Chamber Limit Switch



Secondary Chamber Limit Switch

1. See *CMI 6.3.1/05-005A)*.

2. Check all other limit switches in the system.

    a. Limit Switch located at upper limit of lid lifter Primary Chamber
    b. Limit Switch located at lower limit of lid lifter Primary Chamber

CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

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

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

6.3.1 General Corrective Maintenance Instructions
6.3.2 Refractory Corrective Maintenance Instructions
6.3.3 Primary & Secondary Burner Corrective Maintenance Instructions
6.3.4 Primary & Secondary Blower Corrective Maintenance Instructions
6.3.5 Waste Oil Burner Corrective Maintenance Instructions
6.3.6 Main Control Panel Corrective Maintenance Instructions

the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Blower		**01-001**	
	Air Proving Switch Replacement		6.3.4/01-001A
	Damper Calibration		6.3.4/01-001B
	Modutrol Resistor Replacement		6.3.4/01-001C
	Damper Crank Arm Replacement		6.3.4/01-001D
	Motor Replacement		6.3.4/01-001E
	Modutrol Motor & Transformer Replacement		6.3.4/01-001F
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		6.3.4/02-001A
	Damper Calibration		6.3.4/02-001B
	Modutrol Resistor Replacement		6.3.4/02-001C
	Damper Crank Arm Replacement		6.3.4/02-001D
	Motor Replacement		6.3.4/02-001E
	Modutrol Motor & Transformer Replacement		6.3.4/02-001F
Primary Burner		**01-002**	
	Replacing Fuel Filter		6.3.1/01-002A
	HT Lead & Electrode Replacement		6.3.3/01-002A
	Diffuser Disc Replacement		6.3.3/01-002B
	Nozzle Replacement		6.3.3/01-002C
	End Cone Replacement		6.3.3/01-002D
	Nozzle Assembly Repair or Replacement		6.3.3/01-002E
	Burner Flexible Oil Line Replacement		6.3.3/01-002F
	Low Level Switch Replacement		6.3.3/01-002G
	Inspection Window Replacement		6.3.3/01-002H
	Fuel Pump Replacement		6.3.3/01-002I
	Control Box Replacement		6.3.3/01-002J
	Oil Tube Replacement		6.3.3/01-002K
	Burner PE Cell & UV Detector Replacement		6.3.3/01-002L
	Burner Fan Motor Replacement		6.3.3/01-002M

Refractory		**05-001**	
	Wall Refractory: Gaps between the Modules		6.3.2/05-001A
	Wall Refractory: Replacement of the Modules		6.3.2/05-001B
	Door Gasket		6.3.2/05-001C
	Castable Refractory		6.3.2/05-001D
	Temporary Repair of Castable		6.3.2/05-001E
Main Control Panel		**03-010**	
	Main Control Panel		6.3.6/03-010A
	Reboot PLC		6.3.6/03-010B
Limit Switch		**05-005**	
	Limit Switch Replacement		6.3.1/05-005A

iv. General Corrective Maintenance Instructions

LIMIT SWITCH REPLACEMENT (6.3.1/05-005A)

1. Loosen the 2 screws holding the limit switch in place.
2. Remove limit switch, replace with a new one (PN: 802T-APE).
3. Take arm off of old body and mount to new.
4. Tighten the 2 screws holding the limit switch body.

REPLACING THERMOCOUPLE (6.3.1/05-002A)

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 (PN: TK-K08B-0100-S) and protection tube (PN: TA-A427A-K08B-010).

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. (ie 20°C would read as -20°C). If this is the case open the thermocouple housing and switch the wires.

REPLACING FUEL FILTER (6.3.1/01-002A 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 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.

v. 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 (6.3.2/05-001A)

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 (PN: 1" x 24" 8# 2600) 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 (6.3.2/05-001B)

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 1: Side view of the Weld Loc Module

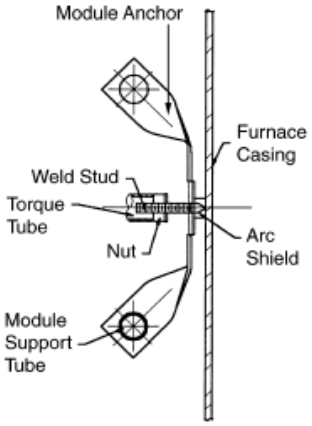
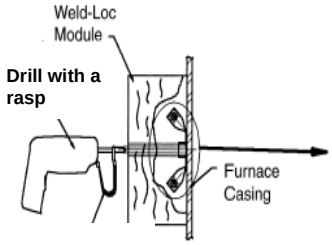


Figure 2: Stud Gun with rasp and Torque Tube (part of module assembly).



C. INSTALLATION: Once the new module is in place take the stud gun (PN: Eco-Stud) 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 (6.3.2/05-001C)

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 (PN: GSB 1.5") 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 (6.3.2/05-001D)

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 (PN: SM3000) 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 (6.3.2/05-001E)

1. Find the pieces of castable refractory that have separated.

2. Clean both the pieces of refractory and the area where the separation occurred.

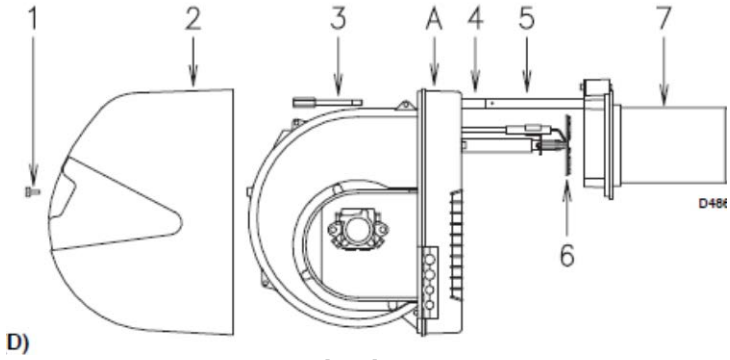
3. Spread an even amount of high temperature mortar on the pieces and the area of separation.

4. Put the pieces back where they originated and support as necessary for a minimum of an hour while the mortar cures.

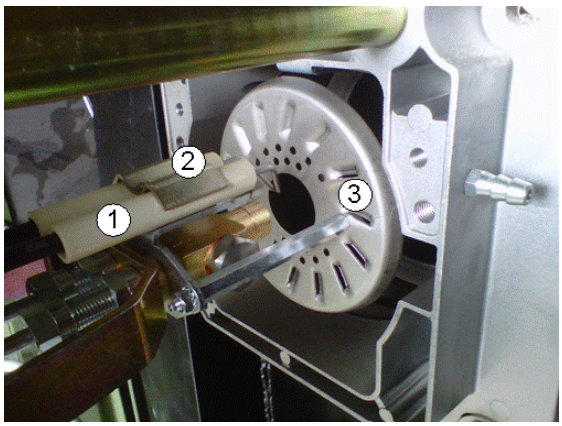
vi. Burner Corrective Maintenance Instructions

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

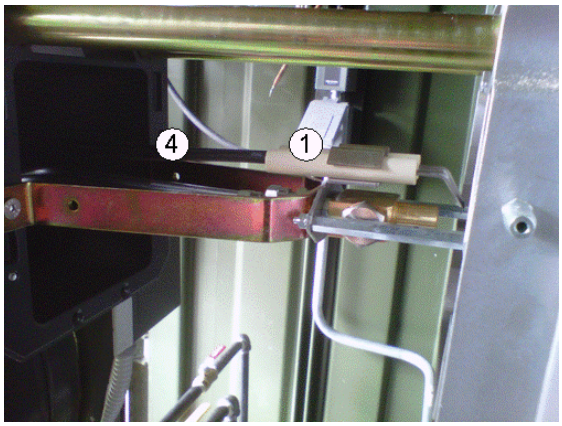
The Burners are pieces of equipment that will require routine corrective and preventive maintenance. Parts within this assembly will need to be repaired or replaced. The most common parts to be repaired or replaced are located at the front end of the burner where the parts are exposed to high temperatures.



Front End Primary Burner



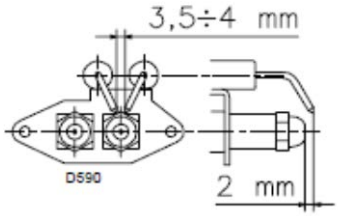
1. Electrode
2. U-bolt
3. Diffuser Disc



4. HT Leads

HT LEAD & ELECTRODE REPLACEMENT (6.3.3/01-002A)

1. In order to change out the HT leads (PN: 3012995) Primary Burner or Electrode (PN: 3003796) 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

DIFFUSER DISC REPLACEMENT (6.3.3/01-002B)

1. Identify 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 PN: 3003791
6. Reassemble.

NOZZLE REPLACEMENT (6.3.3/01-002C)

1. Identify 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 PN: C5222433

END CONE REPLACEMENT (6.3.3/01-002D)

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 PN: 3003807

5. Reinstall the burner.

NOZZLE ASSEMBLY REPAIR OR REPLACEMENT (6.3.3/01-002E)

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.

The parts (seals, nozzle assembly) needed for these replacements are all included under one part number.

- Primary Chamber Burner nozzle assembly: PN: 3003814

Remove all connections to the nozzle assembly and replace with the above parts.

BURNER FLEXIBLE OIL LINE REPLACEMENT (6.3.3/01-002F)

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: PN: C5281160

4. Open ball valve.

Primary Chamber Burner Flexible lines
(Item # 1 Above)

LEVEL SWITCH REPLACEMENT (6.3.3/01-002G & 02-002G)

The level switch is located in the Fuel Tank.

NOTA
Tanks do not have to be emptied to replace.

1. Unplug the level switch.
2. Disconnect the cord and remove the level switch.
3. Replace level switch (PN: FS301-01) and reconnect the cord.
4. Plug in the level switch.

INSPECTION WINDOW REPLACEMENT (6.3.3/01-002H & 02-002H)

To replace the inspection window simply remove the old inspection window and replace with a new one:

- Primary Burner inspection window PN: 3003763

FUEL PUMP REPLACEMENT (6.3.3/01-002I)

Identify the pump on the burner you wish to replace.

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: PN: 3013027

CONTROL BOX REPLACEMENT (6.3.3/01-002J & 02-002J)

Identify the control box on the burner you wish to replace:

Ensuring the power is off unscrew the old control box and install the new one.

- Primary Burner: PN: 3012933

OIL TUBE REPLACEMENT (6.3.3/01-002K)

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 on the 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: PN: 3003821
  PN: 3003822

BURNER PE CELL REPLACEMENT (6.3.3/01-002L)

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.

BURNER FAN MOTOR REPLACEMET (6.3.3/01-002M)

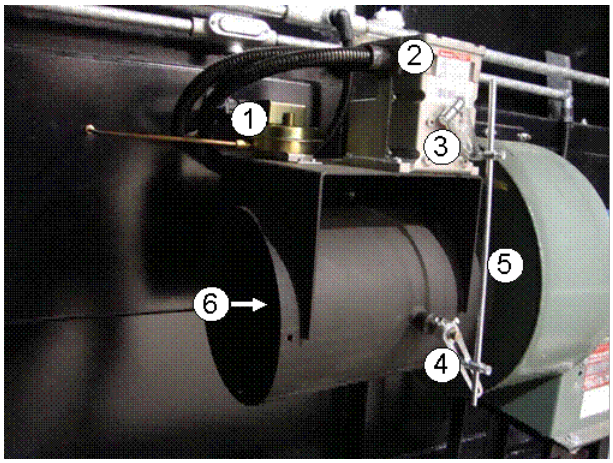
Identify the malfunctioning motor in the affected burner:

Unbolt and remove the malfunctioning motor from the housing. Disconnect all electrical connections. Reinstall the new motor exactly how the old motor was installed.

vii. 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.

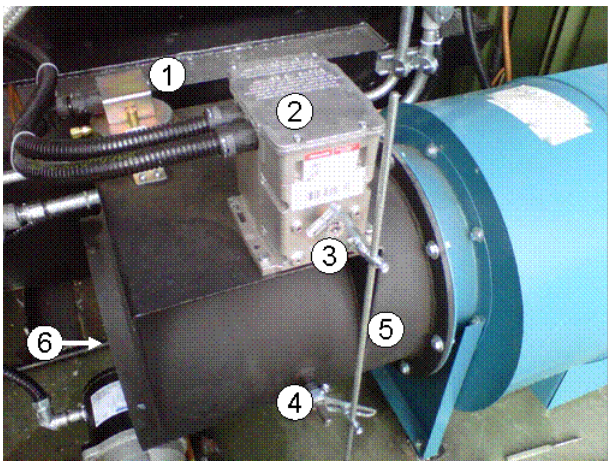
Primary Blower assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



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.



*Sample picture of a Secondary Blower and its assembly

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 (6.3.4/01-001A & 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 (PN: SML8221210034) complete with tubing and wiring and then retighten.
6. Turn power back on.

DAMPER CALIBRATION (6.3.4/01-001B & 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 (6.3.4/01-001C & 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 (6.3.4/01-001D & 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 (PN: 26026G) and ensure it is in the same spot as the old one.

MODUTROL MOTOR & TRANSFORMER REPLACEMENT (6.3.4/01-001F & 02-001F)

To replace the Modutrol motor all power needs 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 all 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 6.3.4/01-001G

1. Turn the Main Disconnect Switch off.
2. Open Panel.
3. Remove the wires from M1.
4. Pull the retaining clip up.
5. Tilt contactor forward and remove.
6. To reinstall tilt new contactor (PN: 100-C09D10) until it clicks back in.
7. Pull the retaining clip back down to lock.
8. Reinstall wires to M1.
9. Close panel.
10. Turn power back on.

viii. Main Control Panel Corrective Maintenance Instructions

MAIN CONTROL PANEL (6.3.6/03-010A)

All control panel diagnostics are to be completed by certified or trained technicians. Electrical drawings / diagrams are provided to aid electricians with any diagnostics.

REBOOT PLC (6.3.6/03-010B)

Turn Main Disconnect to the off position on the front of the Control Panel. Turn the main disconnect back on.

SECTION 7

PARTS LIST

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

General Incinerator Components	Quantity		Part #	Supplier
Primary Door Bearings			F4B-E-200R DGE	Canadian Bearings Ltd.
Secondary Door Bearings	5		F4B-E-104R DGE	Canadian Bearings Ltd.
Stack Bearings	2		P2B-SC-100	Canadian Bearings Ltd.
Toggle Clamps US$	6		51335A66	McMaster-Carr
View Ports	5		P1030/8	Pegasus
Thermocouple	4		TA-A427A-K08B-010.0	Thermo-Kinetics Company Ltd.
Metal ash bins 2.5 yds with lid	2		JT-2.5-60-188	JT Fabrication Ltd..
Blower Assemblies	Quantity		Part #	Supplier
Primary Chamber Blower	1		BI10	Canarm
Secondary Chamber Blower w/flanges	1		BI13	Canarm
Modutrol	2		M9184D4009	Yorkland Controls Limited
Air Proving Switch	3		SML 8221210034	Yorkland Controls Limited
Primary Chamber Burner	Quantity		Part #	Supplier
Primary Burner RL 28/2	1		C9511200	Riello
Fuel Tank 4500l	1		6011000	Hassco Industries Inc.
Ktech 37.5" low level switch stainless steel	1		FS301SF-1 28”NC	Ktech Industrial Products Inc.
Diesel filter	1		VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B		National Energy Equipment Inc.
High Output Used Oil Burner	Quantity		Part #	Supplier
Special 6514-8-A fireall dual fuel burner complete with refractory tile, standard capacity iron nose	1		6514-8-A/LX/1.0A-X13546	Fives North American Combustion
3/4" Pilot Set	1		4015-0-T	Fives North American Combustion
1/2" std regulator	1		7218-01	Fives North American Combustion
3/8" sensitrol oil valve	1		1813-02-D	Fives North American Combustion
1/2”dia. x 18” AOL; 1/2” mnpt connectors e/e; braided CGA approved and tagged	1		C8777-01/18-CGA	Fives North American Combustion
2" butterfly valve	1		1122-4	Fives North American Combustion
Gauge, 0 - 60" wc and 0 - 35 osi	2		8735-HI	Fives North American Combustion
8" wafer valve	1		1156-9	Fives North American Combustion
Control motor, 310 IN/LBS, 37 second timing,4-20 ma, no feedback signal, 1000 ohm potentiometer, 135 degree travel, 110-120VAC	1		1615-F	Fives North American Combustion
Bracket and Linkage for 1615-A through N, for 1136, 1146, and 1156-9 through -22	1		2-9004-205	Fives North American Combustion
Pressure switch, 12 - 60" wc	1		8757-GAO-A4/4/6	Fives North American Combustion
DIF. PRES. SW 1-20"W.C.AUTO.RST	1		C8757-DG50T-DIF	Fives North American Combustion
1/2" ball valve	4		C1821-01	Fives North American Combustion
1/4" ball valve	5		C1821-03	Fives North American Combustion
Pressure gauge, 2-1/2"; 0-60 psi/400 kPa, dual scale; liquid filled 1/4" bottom; SS case;	2		C8735-M-LF	Fives North American Combustion
1/2" pressure regulator	1		7142-01-25	Fives North American Combustion
1/2" relief valve	1		7177-01-75	Fives North American Combustion

Pressure switch #B424B range=0-100 psi	2	C8757-B424B-100	Fives North American Combustion
1/2" oil solenoid valve, NEMA 3R	1	1483-01	Fives North American Combustion
1/2" automatic reset oil shutoff valve 120/1/60	1	1517-01	Fives North American Combustion
1/4" Oil flow meter nickel-plated brass housing Buna o-ring 0.2-0.9 GPM SS orifice and spring vertical flow up	1	8598B-03-0.9-VU	Fives North American Combustion
1/2" ratiotrol with gauges	1	7052-01-WG	Fives North American Combustion
1/2" expansion chamber	1	C7000-0-HSR	Fives North American Combustion
3/4" regulator	2	C1485-01	Fives North American Combustion
Combution Blower -Chicago Blower	1	D53 E4	Canada Blower
Burner control	1	RM7895C1012	Yorkland Controls Limited
1" three way valve	1	4093T25	McMaster-Carr
1/2" three way valve	1	4093T23	McMaster-Carr
Used Oil Pump	1	03HB1131 code10/13	Albany Pump Company Ltd.
Basket suction strainer with 60 mesh	1	SBS-100	Albany Pump Company Ltd.
Ball Valve, 1” NPT, cUL Listed	1	BAVA-100	Albany Pump Company Ltd.
Relief Valve c/w WS spring (30-100 PSI)	1	FVJ-3R-SS	Albany Pump Company Ltd.
Pressure gauge, 4” Dial; liquid filled, 100 PSI	1	PG100LF-100	Albany Pump Company Ltd.
Compound Gauge;4" Dial; liquid filled; 30-0-30 PSI	1	CG100LF-30/30	Albany Pump Company Ltd.
Watson McDaniel size 3/4” Series ‘B’ pressure reducing valve	1	with Viton disc and diaphragm. 1-50 psig	Albany Pump Company Ltd.
Waste Oil ciculation heater with controller 600v. 3ph, 4687watts	1	CBLS747E13S	Hassco Industries Inc.
Transfer Pump	1	FR450B	National Energy Equipment Inc.
Oil Filter	1	VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B	National Energy Equipment Inc.
Waste oil Tank 5000L	1	CUSTOMTANK	Hassco Industries Inc.
Level Switch	1	FS301SF-1 45”NC for 60 dia. tank	Ktech Industrial Products Inc.
Mixer	2	NP HGL-3.3	Metex Corporations
Waste oil totes IBC containment	2	H4435	ULINE CANADA CORPORATION
Waste oil totes IBC	2	H-3886	ULINE CANADA CORPORATION
Salt and/or sand box spillage kit	2	S18304	ULINE CANADA CORPORATION
Top Loading Package	Quantity	Part #	Supplier
Lid lifter HT 3500 Stoke 72"	1	9-LL-3500-72-BE-575	Canada Hydraulique Equipment Inc.
Lid Lifting Link Assembly	4	ECO5TN2PV-06-XX	P.D.S. WELDING LTD
Jaw Only 3/4" - 10 Right Hand Thread 12" max adj	4	3001T23	McMaster-Carr
18-8 Stainless Steel Clevis Pin, 3/4" Dia 2" L	4	92390A521	McMaster-Carr
Opacity Monitor	Quantity	Part #	Supplier
Compliance Opacity Monitoring System (EPA PS-1)	1	PN 80-0290	Akrulogic
Includes:			
Transceiver / Reflector			
Stack Mounting Flanges			
Local Control Panel			
1hp Air Purge Assembly			

-60C Air Purge Hose (2 pcs @ 20')	1	PN 80-3411 (Upgrade)	Akrulogic
Opacity Optic Head Extension Control Cable	1	PN 80-0297	Akrulogic
Scale	Quantity	Part #	Supplier
4 x 4 Scale w/ digital indicator, analog output and weather gland	1		Matrix Scale Service Inc.
Electrical	Quantity	Part #	Supplier
IEC 60 amp 600 volt rotary disconnect	1	GS2GU3N	Graybar
Disconnect operating handle	1	GS2AH420	Graybar
Operating shaft	1	GS2AE81	Graybar
175 amp power distribution block	1	PDB220-3	Graybar
175 amp power distribution block cover	1	CPB162-1	Graybar
Ground lug	1	LAMA2/0-14-QY	Graybar
600 volt 30 amp 3 pole class J fuse block	11	JT60030	Graybar
250 volt 30 amp 1 pole class RK1 fuse block	11	H25030-1CR	Graybar
600 volt 60 amp class J fuse	3	LPJ-60SP	Graybar
600 volt 17 amp class J fuse	3	LPJ-17SP	Graybar
600 volt 10 amp class J fuse	3	LPJ-10SP	Graybar
600 volt 7 amp class J fuse	8	LPJ-7SP	Graybar
600 volt 4 amp class J fuse	9	LPJ-4SP	Graybar
250 volt 30 amp class RK1 fuse	1	LPNRK-30SP	Graybar
250 volt 10 amp class RK1 fuse	1	LPNRK-10SP	Graybar
250 volt 6 amp class RK1 fuse	1	LPNRK-6SP	Graybar
250 volt 5 amp class RK1 fuse	2	LPNRK-5SP	Graybar
250 volt 2 amp class RK1 fuse	2	LPNRK-2SP	Graybar
250 volt 1 amp class RK1 fuse	4	LPNRK-1SP	Graybar
12 amp IEC contactor 120 VAC coil	1	LC1D12G7	Graybar
9 amp IEC contactor 120 VAC coil	6	LC1D9F7	Graybar
4 N.O. top mount auxilary contact	1	LADN40	Graybar
IEC solid state overload relay range 6.4- 32 a	1	LR9D32	Graybar
IEC solid state overload relay range 1.6-8 a	2	LR9D08	Graybar
IEC solid state overload relay range 0.2- 2 a	2	LR9D02	Graybar
16 amp SPDT slim line relay 120 VAC coil	10	RXG15F7	Graybar
Base slim line relay	10	RGZE1S35M	Graybar
8 PIN tube based relay 120VAC coil	10	RUMC23F7	Graybar
DPDT 8 PIN tube based relay base	10	RUZC2M	Graybar
600 to 120 VAC 3000 VA transformer	1	CE3000JA	Graybar
24 VDC 1.3 amp switching power supply	1	PS5R-SC24	SnS
5 port unmanaged ethernet switch US$99	1	SE-SW5U	Automation Direct
Current transducer US$75.5	1	ACT050-42L-F	Automation Direct
10.4" TFT touch panel with Intouch run time	1	TCND1U-10AC-CM2	Wonderware Canada East
600 volt 3 H.P. V.F.D.	1	ACS25-03U-04A1-6	Gerrie
480 volt 8 amp line reactor	1	3PR-004C5H	Graybar
0-1" H2O draft transmitter	1	616KD-00	Furneco
Ethernet PLC programing port	1	P-R2-F3R0	Gerrie

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

22mm Green illuminated push button operator	2	ZB5AW333	Graybar
22mm Emergency stop push button operator	1	ZB5AS844	Graybar
22mm 3 position return to center selector switch	1	ZB5AD5	Graybar
22mm Green flush push button operator	2	ZB5AA34	Graybar
22mm Black flush push button operator	2	ZB5AA24	Graybar
22mm Red extended push button operator	2	ZB5AL4	Graybar
Green integrated led module	2	ZBVG3	Graybar
N.O. contact block	5	ZBE101	Graybar
N.C. contact block	3	ZBE102	Graybar
Limit switch	4	802T-AP	Gerrie
Limit switch lever	4	802T-W2B	Gerrie
18 mm AC inductive proximity switch US$31	2	VK1-AO-1B	Automation Direct
Pt100 RTD for cold junction compensation	1	TFD	Omega
Unity CPU cw 1 Enet port and 1 serial port	1	BMXP342020	Graybar Canada Inc.
8 Slot Backplane	1	BMXXBP0800	Graybar Canada Inc.
110Vac Power supply	1	BMXCPS2000	Graybar Canada Inc.
16 point 120 vac input module	2	BMXDAI1604	Graybar Canada Inc.
8 channel analog input module	1	BMXAMI0810	Graybar Canada Inc.
4 channel thermocouple input module	1	BMXART0414	Graybar Canada Inc.
16 point relay output module	1	BMXDRA1605	Graybar Canada Inc.
4 Channel analog output module	1	BMXAMO0410	Graybar Canada Inc.
Connectors for all modules except AMI0810 and ART0814	4	BMXFTB2000	Graybar Canada Inc.
Connector for AMI080	1	BMXFTB2800	Graybar Canada Inc.
Connector	1	BMXFCW301S	Graybar Canada Inc.
IEC solid state overload relay range 0.2- 2 a	1	LR9D02	Graybar
1hp VFD ABB	1	ACS250-03U-02A1-6	Gerrie
1hp line reactor	1	REX3PR0002C5H	Graybar Canada Inc.
Type K Thermocouple 20AWG	300	K-20S-TT	Thermo-Kinetics Company Ltd.

APPENDIX B • SECONDARY INCINERATOR DESIGN REPORT

Meliadine Secondary Incinerator

Design Report and Drawings

60-Day Notice to Nunavut Water Board

In Accordance with Water License 2AM-MEL1631
(Part D, Item 1)

Prepared by:

Agnico Eagle Mines Limited – Meliadine Division

Date: July 2023

Document Control

Version	Date (YMD)	Section	Page	Revision
R0	2023-07-31			Incinerator Design Report

Prepared By: Amanda Seguin
E&I Mechanical EIT

Reviewed By: Gary Smordin
Senior Engineer
NAPEG # L1838

Approved By: Gary Smordin
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
G.M. SMORDIN
LICENSEE
NWT/NU
August 18, 2023

PERMIT TO PRACTICE
EAGLE INSPECTIONS & ENGINEERING INC.
Signature
Date August 18, 2023
PERMIT NUMBER: P 1090
NT/NU Association of Professional Engineers and Geoscientists

Table of Contents

List of Appendices

1. Introduction

1.1 Site Location and Access

Agnico Eagle Mines Limited (Agnico Eagle) is operating the Meliadine gold mine (the Mine) located approximately 25 km North of Rankin Inlet and 80 km Southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. This site is located on the Western shore of the Hudson Bay and the project site is located on the Peninsula between the East, South and West basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42''W) on Inuit Owned Land. The area is accessible from the All-Weather Access Road (AWAR) linking the Meliadine mine site with Rankin Inlet.

1.2 Existing and Future Site Facilities

The Meliadine mine includes several water management infrastructures, such as water retention dikes, berms, culverts, channels, collection ponds, pumping stations, freshwater intake, and water treatment plants. These infrastructures are required to manage water during pre-production, operation, and interim mine closure. The Nunavut Water Board (NWB) has issued a Type A Water License 2AM-MEL1631 (Water License) to Agnico Eagle for the Meliadine mine, authorizing the use of water and the disposal of waste required by mining and milling and other related associated uses.

This report includes the final design and construction drawings for the secondary incinerator and building, as per the Water License (Part D, Item 1). The secondary incinerator at the Mine is intended to supplement the capacity of the first incinerator already approved under the Water License (Meliadine Incinerator Design Report and Drawings, Agnico Eagle Mines Limited, April 2017).

The location of this secondary incinerator is presented in Figures 1 and 2 below.

1.3 Location of the Secondary Incinerator Building

The location of the secondary incinerator will be in the central North-East side of the Meliadine project and will be constructed 4 meters from the primary incinerator building.

Figure 1 demonstrates the site view location of the primary incinerator area.

Figure 2 represents the survey view of the primary incinerator with respect to the secondary incinerator location.

Figure 1 Site View – Location of Secondary Meliadine Incinerator

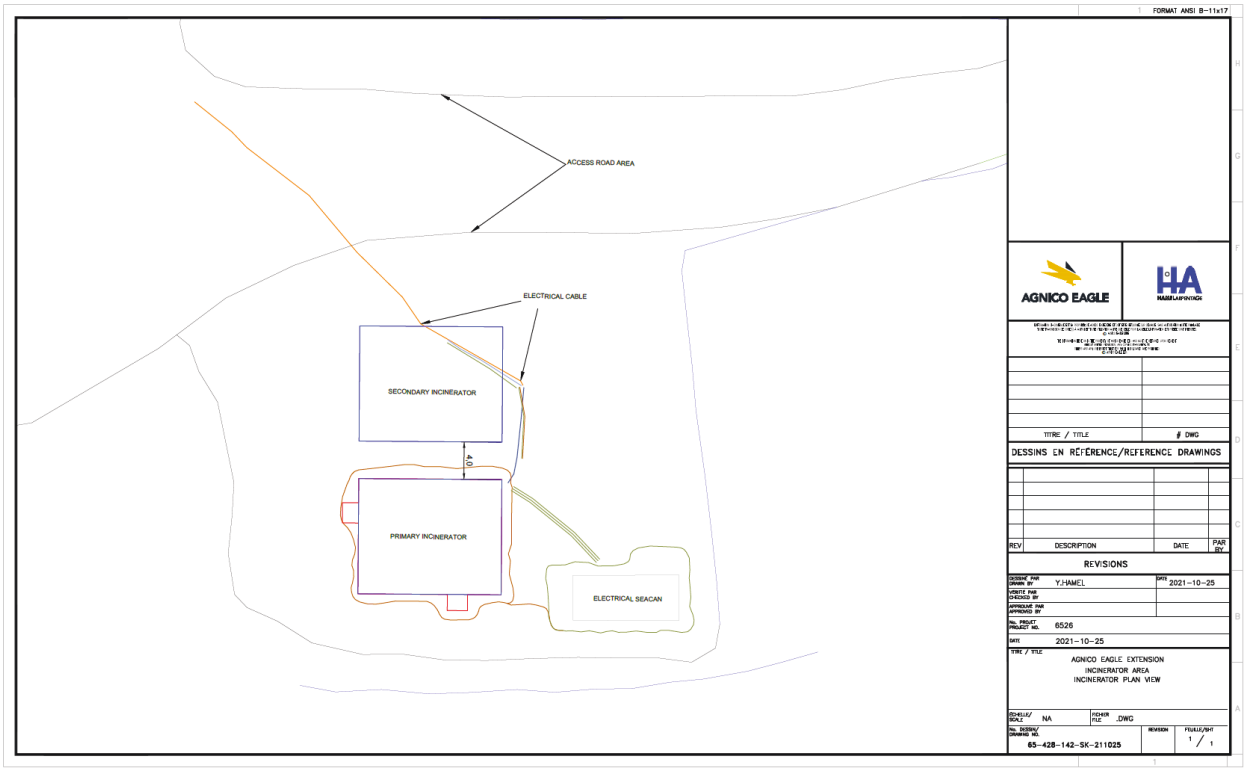


Figure 2 Survey View – Location of Secondary Meliadine Incinerator

2. Design

2.1 Overall Waste Management Strategy

At the project site, waste is safely managed from the time it is produced until final disposal as per relevant management plans, namely Landfill and Waste Management Plan, Hazardous Materials Management Plan, and Incineration Management Plan.

All wastes are segregated at the mine site and are predominately landfilled, incinerated, or recycled. Remaining wastes, including hazardous waste, are packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

Incineration is an essential part of waste management at Meliadine mine. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunchrooms, shops, warehouses, and offices diverts waste from directly reporting to the on-site landfill. It has the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

The secondary incinerator will contribute to Meliadine's overall waste management strategy by maintaining continuity of the waste burns when there is maintenance work being conducted on the site's primary incinerator and also by providing additional capacity of waste material that can be burnt, reducing the likelihood of incinerable waste backlog.

2.2 Description of Incinerator

The KETEK CY-100-CA-D incinerator is a dual-chamber system that operates under starved-air conditions.

The incinerator components are presented in Figure 3 and Figure 4 of this document and includes:

- Primary and secondary chambers
- Main control panel
- Diesel fuel tank

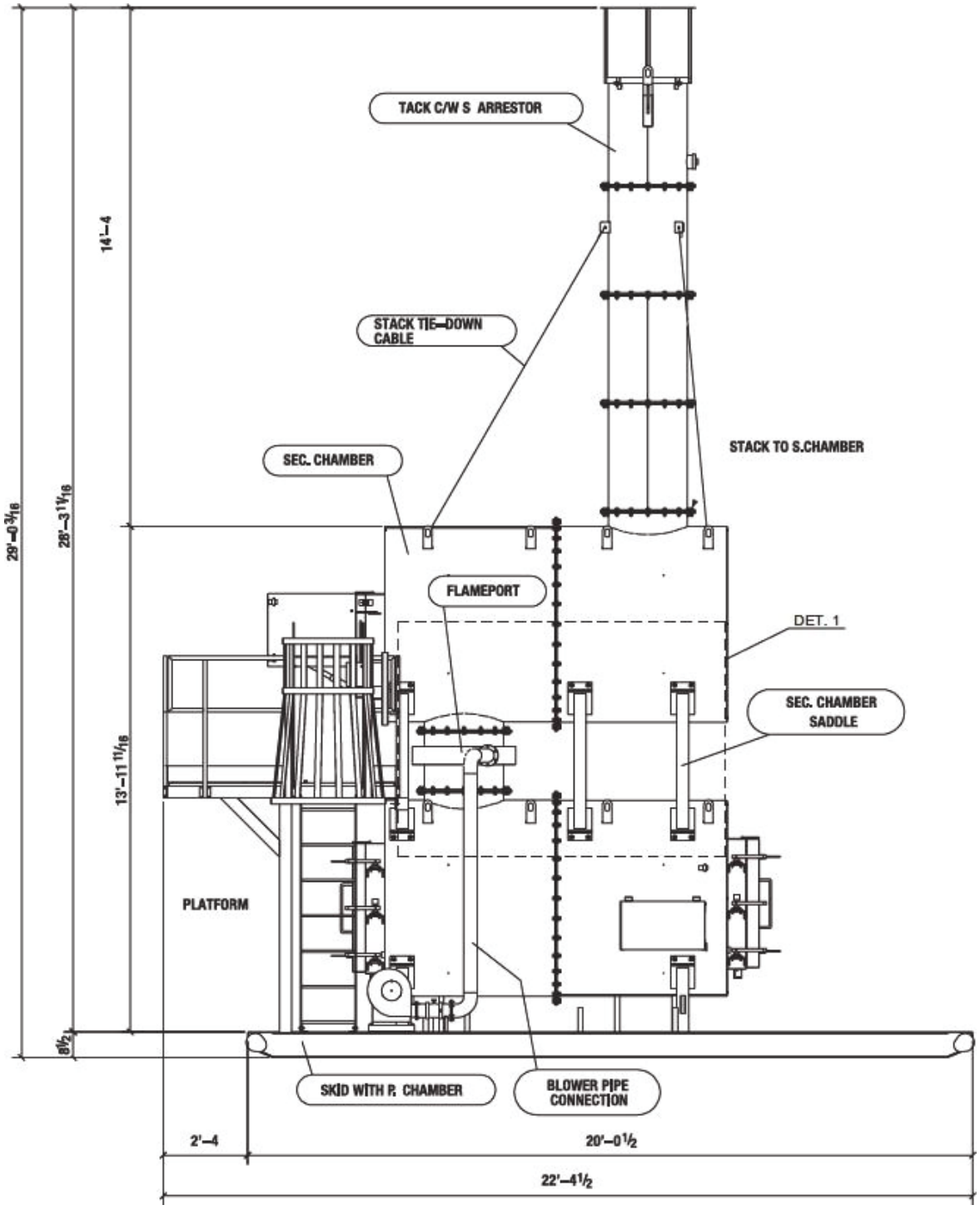


Figure 3 Ketek – System Schematic

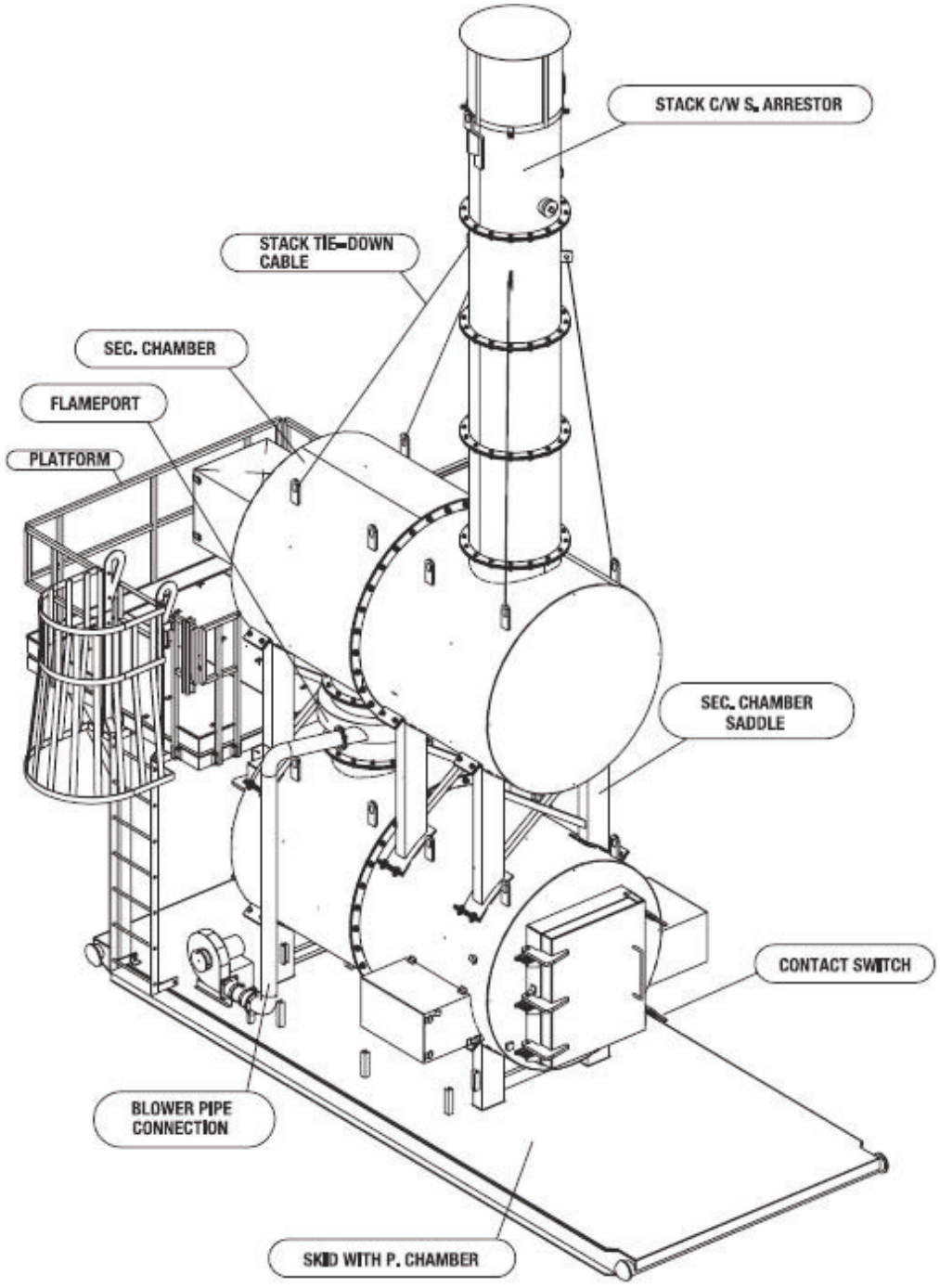


Figure 4 Ketek – Section View Schematic

Primary Chamber

The primary chamber is the first stage of the incinerator where two (2) Becket 2X WIC-201 770,000 BTU/hr. diesel fired burners are used to increase the temperature of the chamber to ensure that the waste will ignite. To save fuel and reduce pollutants, the burn process becomes self-fueling once the chamber reaches the appropriate temperature. This chamber is insulated and has the appropriate refractory to retain the required heat inside the chamber.

Components of the primary chamber include the auxiliary burners, a thermocouple to regulate the burner temperature, a charging door to load the system, an ash door and the contact switch which turns off the burners when the doors are open.

Secondary Chamber

The primary and secondary chambers are connected by a flame-port.

Combustion air is delivered to the secondary chamber through the flame-port using a blower.

The secondary chamber is the second stage of the incinerator where one (1) Becket WIC-301 1,600,00 BTU/hr. diesel fired burner is used to maintain the high temperature required to keep the waste ignited and maintain turbulence from the delivery of oxygen by the blower which ensures no black smoke is generated from the system.

The components of the secondary chamber include the auxiliary burners which are utilized to initiate the start-up procedure and maintain the minimum required temperatures in the chambers, a ceramic thermocouple to measure the temperature in the chamber, the flame-port plenum to mix the combustible gases and flame-port air, the flame-port blower which is the combustion air supply to the flame-port plenum, the flame-port throttle with controls the airflow and the stack which disperses flue gasses.

Burner Controls

The burner controls include a thermostat, relay protection, the option for limited recycle, limited reset, three (3) status lights, valve-on delay/motor-off delay signals, 15-second lockout time option, interrupted and intermittent duty ignition, technician pump priming mode, disable function and a communication port.

Chimney Design

The stack is refractory-lined and has a diameter of 457mm. The height of the stack is 4.24m with the spark arrestor.

The chimney will abide by the manufacturers installation and preparation instructions and will have a minimum clearance of 2 feet from the highest adjacent building with a minimum 6'' flue pipe and an 8''x 8'' inside chimney. The chimney flue will be a minimum of 3 feet from the highest point from which it erects from the building and will have an upward pitch toward the chimney of at least 0.25'' per foot of length. The incinerator will have adequate space around the burner for ease of service and maintenance.

Diesel Fuel Tank

The diesel fuel tank will be utilized to supply the burners on the incinerator with a 4550L ULC approved diesel fuel storage containment tank manufactured by Granby Industries.

2.3 Ash Removal

The ashes leftover from the burns are left to cool inside the combustion chamber and are manually removed through an 86cm x 70cm ash door. Once cool, the ash is placed inside a large metal container.

The ash disposal process has been defined in the Incineration Management Plan and will follow the same procedure as the first incinerator that was installed at Meliadine.

An ash testing protocol is followed to ensure the ash is suitable for disposal in the landfill and if there is concentration of metals that exceed the Government of Nunavut's Environmental Guideline for Industrial Waste Discharges, the ash will be disposed of according to the Incineration Management Plan.

2.4 Air Quality Monitoring

The incinerator stack will be tested through sampling ports on a yearly basis in accordance with the Canadian Council of Ministers of the Environment (CCME): Canada-Wide Standard for Dioxins and Furans, and Canada-Wide Standards for Mercury Emissions.

3. Construction Methods and Equipment

3.1 Construction Methods and Equipment

Construction of the secondary incinerator facility will be performed on site, by qualified Agnico Eagle employees with the support of the following contractors and specialists:

Company Name	Role
BBA	Civil engineering drawings
Audet & Knight	Ground and civil work
Honco	Building procurement and installation
WSP	MPEI engineering drawings and installation support

The incinerator building will be erected on the existing industrial pad. Therefore, no additional granular fill will be required for this construction and no geochemical analysis of waste rock and fill is to be conducted.

No sedimentation or erosion issues are expected due to the nature of the work. Any required mitigation measures will be put in place as per the Sediment and Erosion Management Plan.

Quality Control and Assurance

A quality control/assurance program is required during construction and will be carried out by qualified Agnico Eagle personnel. It will ensure that the construction is as per the Design report and best management practices.

Periodic visual inspections for compliance with the design will be performed. A record of as-built drawings will be produced.

3.2 Testing and Inspection

Prior to start-up, the incinerator will be tested to ensure all mechanisms are functioning properly and the verification will include all the required trades who will be involved in operating the incinerator. The safety functions and requirements will be verified and tested prior to start-up and fire protection requirements will be verified to ensure all CSA and NFPA codes are respected.

The team will receive official training from Ketek on all operational procedures prior to operating the incinerator.

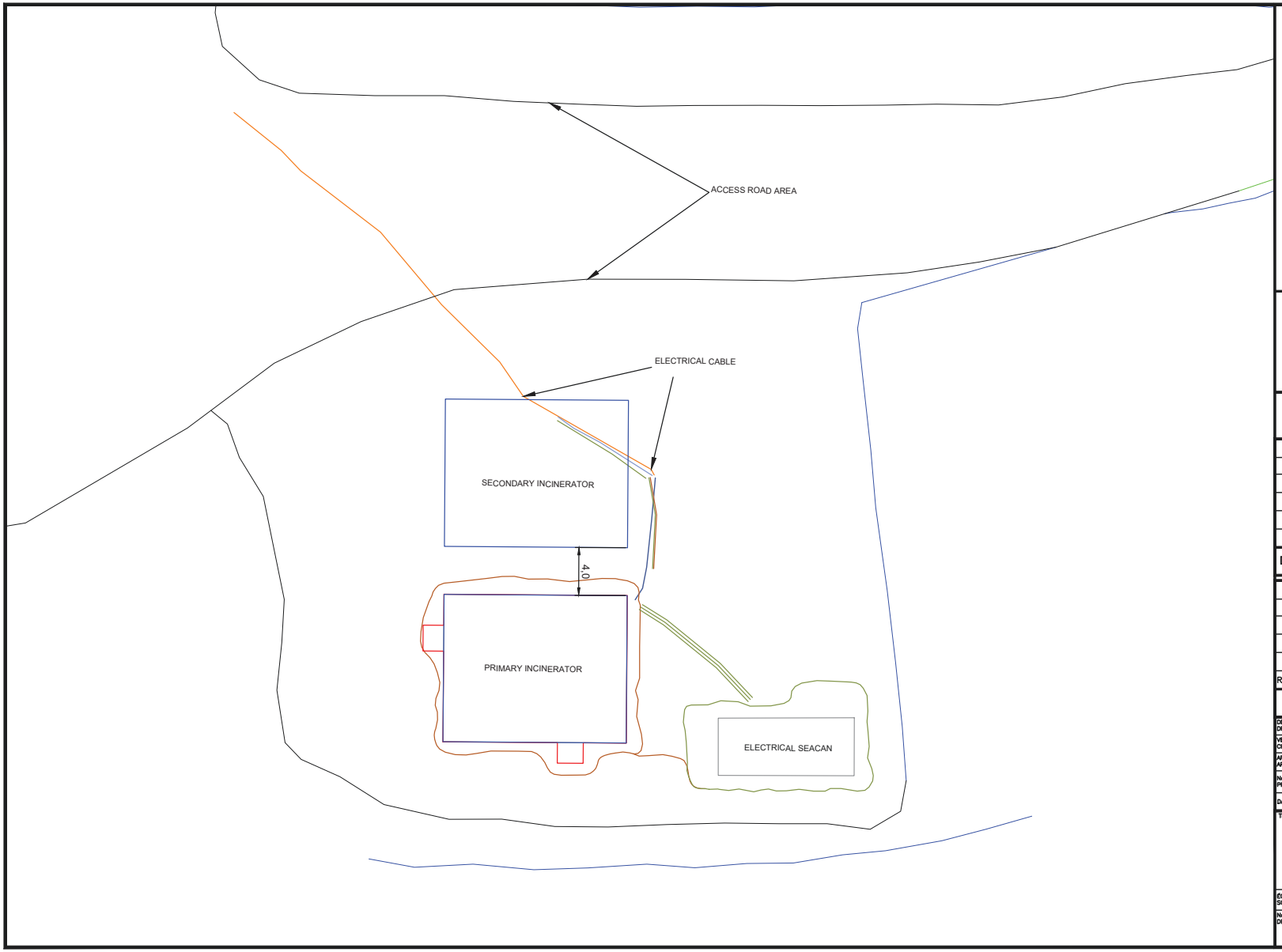
Inspections and maintenance will be carried out as per the Incineration Management Plan.

3.3 Timeline

The proposed date of construction of the secondary incinerator facility is planned for October 2023 and the tentative date for commissioning the permanent infrastructure is November 2023.

Appendix A: General arrangement survey of area plan view for location of new building

File Name: 65-428-142-230-SK-211025



AGNICO EAGLE

HAMELARPENTAGE

TITRE / TITLE	# DWG
DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS	

REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR / DRAWN BY	Y.HAMEL	DATE	2021–10–25
VÉRIFIÉ PAR / CHECKED BY			
APPROUVÉ PAR / APPROVED BY			
No. PROJET / PROJECT NO.	6526		
DATE	2021–10–25		

TITRE / TITLE

AGNICO EAGLE EXTENSION
INCINERATOR AREA
INCINERATOR PLAN VIEW

ÉCHELLE/ SCALE	FICHIER / FILE		
NA	.DWG		
No. DESSIN/ DRAWING NO.		REVISION	FEUILLE/SHT
65–428–142–SK–211025			1 / 1

Appendix B: Pile design from BBA

File Name: 65-428-230-001-01

NO. DESSIN
DRAWING NO. 65-428-230-001

FORMAT ARCH D

NOTES:

1.0- GENERAL

1.1- IN THE EVENT OF CONFLICT BETWEEN DESIGN STANDARDS, CONTRACT DOCUMENTS AND DRAWINGS, INFORMATION GIVEN ON DRAWINGS SHALL GOVERN.

1.2- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON SITE BEFORE STARTING WORK AND REPORT ALL ERRORS OR OMISSIONS TO THE ENGINNER.

1.3- THE CONTRACTOR SHALL CONSIDER THAT THE EXECUTION OF THE WORK DEPENDS ON THE SITE CONDITIONS. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS NOT SPECIFICALLY SHOWN ON THE DRAWINGS BUT REQUIRED TO COMPLETE THE WORK TO THE SATISFACTION OF THE ENGINEER. ALL MATERIALS SHALL BE NEW, IN GOOD CONDITION AND PRENIUM QUALITY.

1.4- THE CONTRACTOR IS REPONSIBLE FOR ANY DAMAGES CAUSED BY HIS EMPLOYEES OR HIS SUBCONTRACTORS. HE SHALL KEEP THE SITE CLEAN AND FREE OF ANY DEBRIS. THE CONTRACTOR MUST COMPLY WITH ALL LOCAL AND OWNER SAFETY RULES.

1.5- ALL TEMPORARY SUPPORTS ARE THE CONTRACTOR'S REPONSIBILITY. HE SHALL APPLY ALL NECESSARY MEASURES AND INSTALL PROPER SUPPORTS TO ENSURE THE STABILITY OF THE STRUCTURES AND THE WOKER'S SAFETY.

1.6- DO NOT SCALE THE DRAWINGS.

1.7- ALL DIMENSIONS ARE SHOWN IN MILIMETRES UNLESS NOTED OTHERWISE.

1.8- ALL ELEVATIONS AND COORDINATES ARE SHOWN IN METERS AND DECIMALS THERE OF.

2.0- PILING

2.1- REFER TO TECHNICAL SPECIFICATION 6515-GNS-010.

2.2- ALL STEEL PIPE PILES SHALL CONFORM TO ASTM A252, GRADE 3.

2.3- ALL MATERIAL SHALL BE NEW AND FREE FROM DEFECTS IMPARING STRENGTH OR DURABILITY.

2.4- THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND ALIGNING THE PILES AFTER THE OWNERS REPRESENTATIVE HAS PROVIDED HIM WITH A BENCH-MARK AND A BASELINE IN THE VICIVITY OF THE WORK.

2.5- THE VERTICAL ALIGNMENT OF PILES SHALL BE WITHIN 2% OF ITS LENGHT. THE HORIZONTAL LOCATION OF PILES MEASURED ON THE PILE CENTERLINE AT THE TOP OF THE PILE SHALL BE WITHIN 50mm OF THE LOCATION SHOWN ON DRAWINGS.

2.6- ALL PILECAP PLATE TO PILE WELDS SHALL BE VISUALLY INSPECTED AND INSPECTION RECORDS SHALL BE PROVIDED TO THE ENGINEER.

2.7- CONTRACTOR SHALL SUBMIT FULL DETAILS REGARDING THE METHOD AND THE SEQUENCE OF PILING INSTALLATION.

2.8- WELDERS SHALL BE QUALIFIED IN ACCORDANCE WITH CWB.

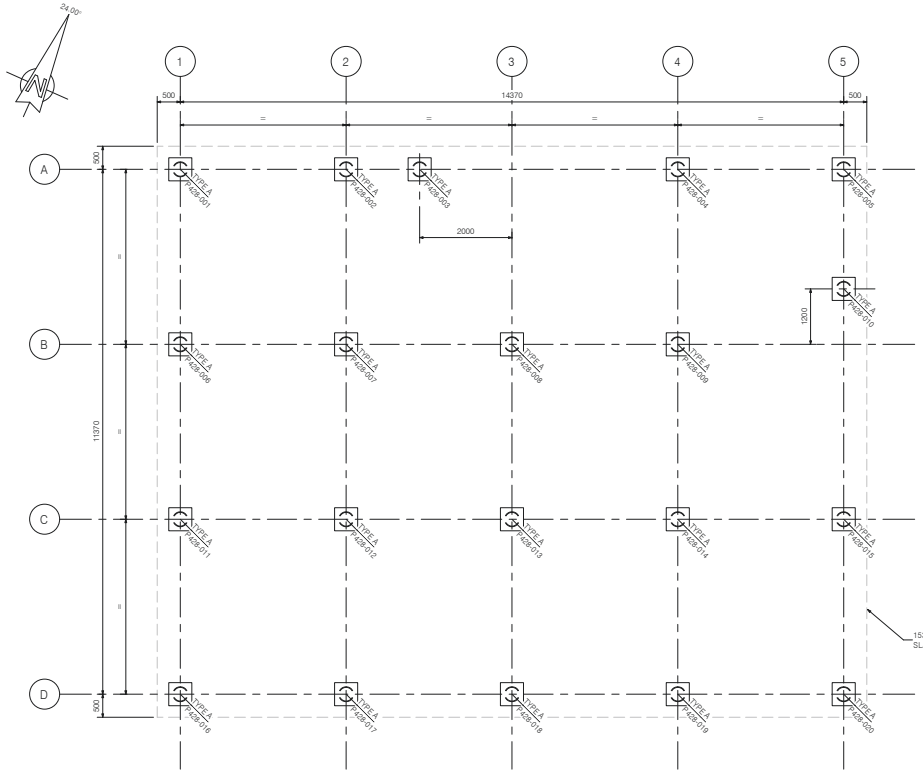
2.9- THE PILING CONTRACTORS PILING EQUIPMENT SHALL BE APPROVED BY A QUALIFIED ENGENEER PRIOR TO INITIATING ANY ANY PILING.

2.10- THE INSTALLATION OF THE PILES SHALL BE MONITORED BY A QUALIFIED ENGINEER OR A DESIGNATED ALTERNATIVE.

2.11- THE TOP END OF STEEL PILE WHICH IS TO RECEIVE CAP PLATE SHALL BE CUT AND GROUND SQUARE TO ENSURE FULL BEARING OF THE PLATE ON THE PILE. MAXIMUM CUT-OFF ELEVATION TOLERANCE FOR EACH PILE SHALL BE +/- 6mm.

2.12- THE BOTTOM SECTION OF THE PILE WICH WILL BE GROUTED SHALL BE THOTOUGNLY CLEANED AND FREE OF ALL GREASE, DIRT AND FOREIGN MATERIAL BEFORE PLACING IN THE HOLE.

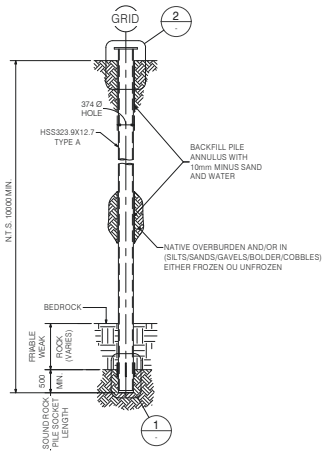
2.13- THE CONTRACTOR MUST PROVIDE A DRILL LOG FOR EACH PILE. ANY DIVERGENCE OF THE DIMENSIONS INDICATED ON THE PILE DETAIL. MUST BE COMMUNICATED TI THE ENGINEER.



PILES - PLAN VIEW

1 : 50

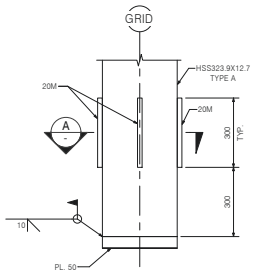
PILE No.	PILE TYPE	CUT-OFF ELEVATION	SOCKET DEPTH	COORDINATES X	COORDINATES Y
P428-001	A	71 975	500mm	539378.0921	6989848.0362
P428-002	A	71 975	500mm	539381.3740	6989849.4974
P428-003	A	71 975	500mm	539382.8288	6989850.1451
P428-004	A	71 975	500mm	539387.9378	6989852.4198
P428-005	A	71 975	500mm	539391.2197	6989853.8810
P428-006	A	71 975	500mm	539379.6336	6989844.5739
P428-007	A	71 975	500mm	539382.9155	6989846.0351
P428-008	A	71 975	500mm	539386.1974	6989847.4963
P428-009	A	71 975	500mm	539389.4793	6989848.9575
P428-010	A	71 975	500mm	539392.2732	6989851.5149
P428-011	A	71 975	500mm	539381.1751	6989841.1115
P428-012	A	71 975	500mm	539384.4570	6989842.5727
P428-013	A	71 975	500mm	539387.7390	6989844.0339
P428-014	A	71 975	500mm	539391.0209	6989845.4951
P428-015	A	71 975	500mm	539394.3028	6989846.9563
P428-016	A	71 975	500mm	539382.7167	6989837.6492
P428-017	A	71 975	500mm	539385.9986	6989839.1104
P428-018	A	71 975	500mm	539389.2805	6989840.5716
P428-019	A	71 975	500mm	539392.5624	6989842.0328
P428-020	A	71 975	500mm	539395.8443	6989843.4940



PILE - TYPE A

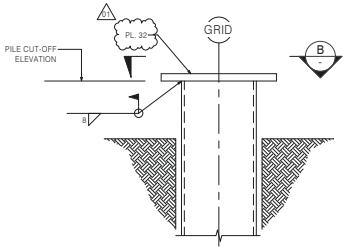
1 : 50

COMPRESSION PILE
1650 kN UNFACTORED WORKING CAPACITY
TENSION PILE
400 kN UNFACTORED WORKING CAPACITY



1 DETAIL

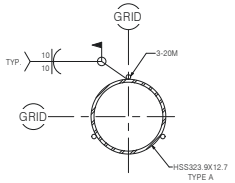
1 : 10



CUT-OFF SCHEMATIC

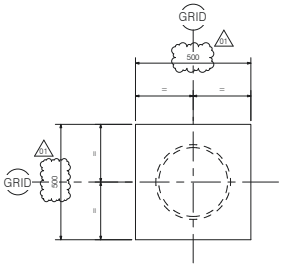
2 DETAIL

1 : 10



A SECTION

1 : 10



B SECTION

1 : 10

FOR CONSTRUCTION

DATE: 2022-06-27

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
01	22/06/27	FOR CONSTRUCTION	T.G.	M.G.	
00	21/11/10	FOR CONSTRUCTION	T.G.	M.G.	

REVISIONS

TITRE / TITLE
AGNICO EAGLE-MELIADINE DIVISION
428 - INCINERATOR
230 - EARTH WORKS (PILING)
PLAN VIEW, DETAILS, SECTION AND TABLES
PILES
INCINERATOR

DESSINÉ PAR DRAWN BY	THIERRY GEMME	DATE 2021-11-01
VERIFIÉ PAR CHECKED BY	ELIAS ALHADDAD, CPI.	2021-11-10
APPROUVÉ PAR APPROVED BY	MARIO GIGNAC, Ing.	2021-11-10
ÉCHELLE SCALE	AS SHOWN	DATE 2021-11-10

NO. DESSIN
DRAWING NO. 65-428-230-001

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
65	01	1 / 1

AE-CART-ARCH D

FILE NO.

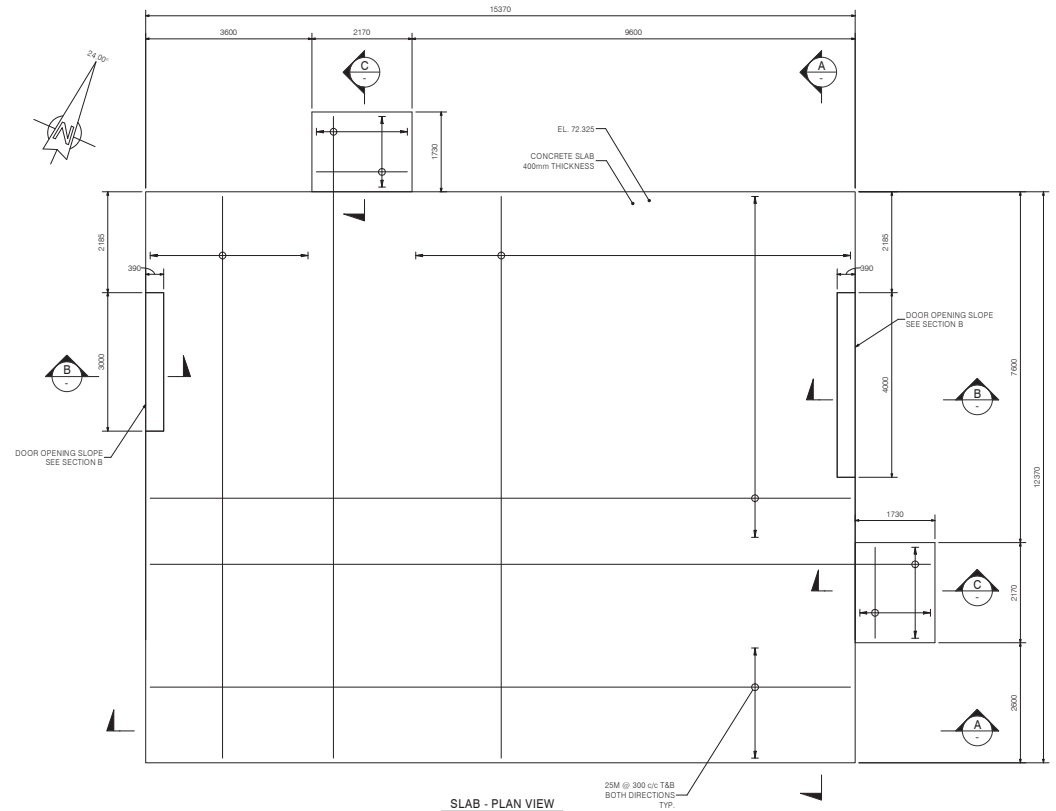
D:\temp\Work\TEMPLATE METmm811b_arch_D.dwg-2013-02-18 14:03:28

Appendix C: Slab design from BBA

File Name: 65-428-240-002

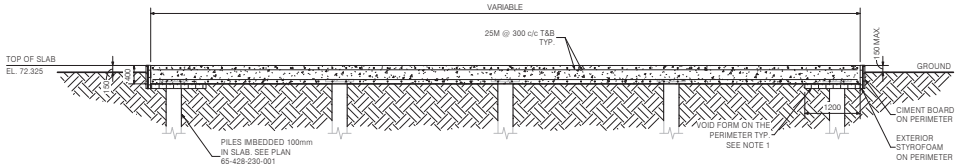
NO. DESSIN
DRAWING NO. 65-428-240-001

FORMAT ARCH D

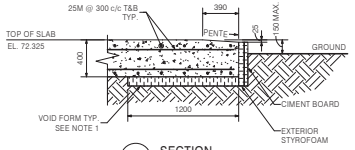


SLAB - PLAN VIEW

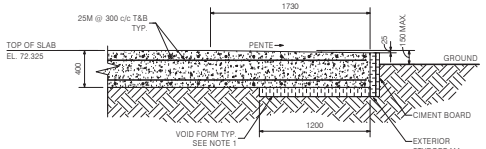
1 : 50
CV = 12 kPa
EQUIPMENT: BROME COMPOSTER 632
KETEK INCINERATOR



A SECTION
1 : 50



B SECTION
1 : 25



C SECTION
1 : 25

FOR CONSTRUCTION
DATE: 2021-11-10

PLAN CLE
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

1. VOID FORM SHALL BE 100mm THICK DYNAVOID 40342 BY BEAVER PLASTICS OR APPROVED EQUIVALENT

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TYPE / TITLE	# DWG
ANCHOR BOLTS LOCATION	65-428-240-001

AGNICO EAGLE

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
00	21/11/10	FOR CONSTRUCTION	T.G.	M.G.	

REVISIONS

392 - - - 10

TYPE / TITLE
AGNICO EAGLE - MÉLIADINE DIVISION
428 - INCINERATOR
240 - CONCRETE
PLAN VIEW, DETAILS AND SECTION
SLAB
INCINERATOR

DESSINÉ PAR DRAWN BY	THIERRY GEMME	DATE 2021-11-01
VÉRIFIÉ PAR CHECKED BY	ELIAS ALHADDAD, CPI.	2021-11-10
APPROUVÉ PAR APPROVED BY	MARIO GIGNAC, ing.	2021-11-10
ÉCHELLE SCALE	AS SHOWN	DATE 2021-11-10

NO. DESSIN
DRAWING NO. 65-428-240-002

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
65	00	1 / 1

AE-CART-ARCH D

C:\temp\Mario\TEMPLATE_METRIRIS_arch_D.dwg-2013-02-19 14:03:29

FILE NO.

Appendix D: Building plans for structural steel from Honco

File Name: C1470-PLAN-STRU-CON

NOTES FOR THE FOUNDATION DESIGN

1. THE FOUNDATION SHALL BE DESIGNED IN ORDER TO RESIST AND TO TRANSMIT ADEQUATELY TO THE THE GROUND THE SPECIFIED DESIGN LOADS MENTIONED ABOVE.
2. ANCHOR BOLTS DIMENSIONS HAVE BEEN ESTABLISHED ASSUMING 20 MPa CONCRETE STRENGHT AT 28 DAYS. THE FOUNDATION DESIGNER MUST INFORM HONCO inc. IF LESSER CONCRETE STRENGHT IS EXPECTED.
3. MAXIMUM TOLERANCE ON FOUNDATION ALIGNMENT, LEVEL AND DIMENSIONS, ON DIAGONAL DIMENSIONS OR 90 DEGREE ANGLES AND ON ANCHOR BOLTS LOCATION IS ±2mm.
4. THE FOUNDATIONS SHALL BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER.
5. THE LOAD FACTORS HAVE NOT BEEN INCLUDED.
6. THE COMPANY HONCO inc. OR THE ENGINEER SIGNATORY OF THE PROJECT IS NOT ASSUMING ANY RESPONSIBILITY AS FAR AS CONCRETE FOUNDATION AND CONSTITUTED COMPONENTS, NOT MANUFACTURED BY HONCO inc., ARE CONCERNED.

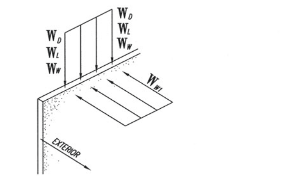
LOADS ON CONCRETE FOUNDATIONS

LEGEND :

LOADS
- W = UNIFORM LOAD
- P = PONCTUAL LOAD
- ω1 = MAXIMUM TENSION REACTION
- ω2 = MAXIMUM COMPRESSION REACTION
- V = SHEAR LOAD AT PANEL BASE

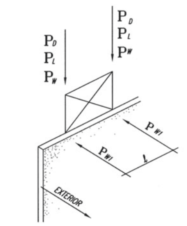
INDEX
- D = DEAD LOAD
- L = LIVE LOAD
- W = WIND LOAD
- E = EARTHQUAKE LOAD
- T = TENSION
- C = COMPRESSION

1. LOAD REACTION ON CONCRETE WALLS (KN/M)

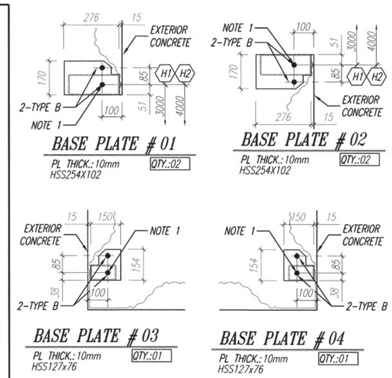


WALLS	W_D	W_L	W_W	W_{W1}
A	5.1	16.1	-6.6	±3.4
B	1.6	1.8	-	±3.4
C	5.1	16.1	-6.6	±3.4
D	1.6	1.8	-	±3.4
SERVICE LOADS IN kN/m				

2. FRAME OPENING REACTIONS



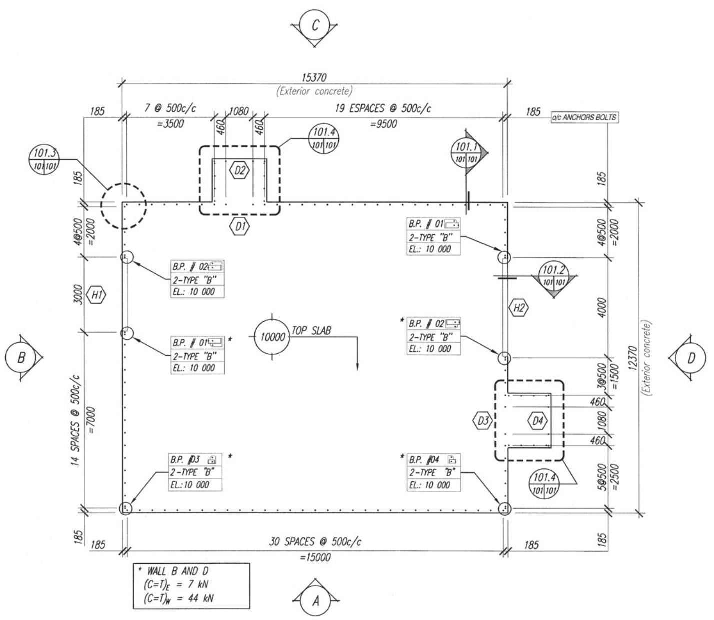
OPENINGS	WIDTH	P_D	P_L	P_W	P_{W1}
H1	3000	2.4	2.7	-	±5.1
H2	4000	3.2	3.6	-	±6.8
SERVICE LOADS IN kN					



NOTE 1:
REFERENCE ANCHOR FOR THE POSITIONING OF THE BASE PLATES. SEE THE o/c ANCHOR BOLTS LOCATION ON THE PLAN VIEW. BE CAREFUL OF THE DIRECTION OF THE BASE PLATE.

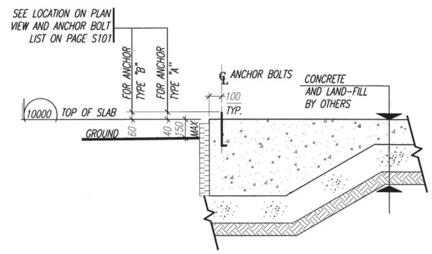
ANCHOR BOLT SCHEDULE

TYPE	DESCRIPTIONS		LOCATION
A	(sketch: 40, 250, 50)	STEEL A36, 16 ø ST-400-3014 QTE : 101	TYPICAL ON FOUNDATION WALL, EXCEPT WHERE INDICATED
B	(sketch: 60, 290, 450)	20M, GRADE 400MPa ST-400-15014 QTE : 12	SEE LOCATION ON VIEW PLAN

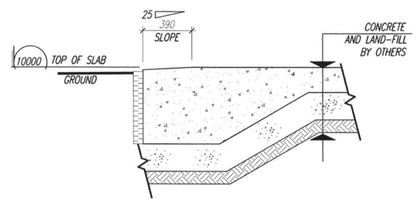


* WALL B AND D
$(C=T)_E$ = 7 kN
$(C=T)_W$ = 44 kN

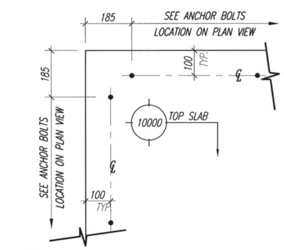
ANCHOR BOLTS LOCATION
SCALE 1:100



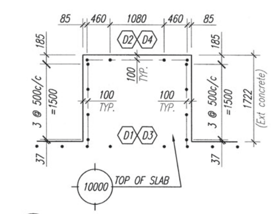
101.1 ANCHOR BOLTS LOCATION
SCALE 1:20



101.2 TYPICAL FONDATION WALL UNDER OVERHEAD DOOR
SCALE 1:20



101.3 ANCHOR BOLTS LOCATION ON CORNERS – TYP.
SCALE 1:10



101.4 ANCHOR BOLTS LOCATION ON SHELTERS
SCALE 1:50

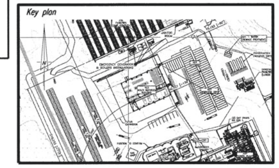
CONCRETE WORK BY OTHER

IMPORTANT NOTICE
LOCATION OF THE FLOOR DRAINS AND OF THE DRAINAGE SLOPES TO BE COORDINATED WITH THE OWNER.
(A MINIMUM SLOPE OF 1,5% SHALL BE FORESEEN)

BASE PLATE IDENTIFICATION
B.P. No ## ⟵ BASE PLATE No
TYPE "X+X" ⟵ ANCHORS TYPE AND QUANTITY
ELEV.: XX XXX ⟵ TOP OF CONCRETE

Client
AGNICO EAGLE

Key plan



no.	by	description	date
R0	M.G.	FOR CONSTRUCTION	2021-07-14

Architect

Mechanical

HONCO STEEL BUILDINGS
1190, Chemin Industriel
Lévis, Qc, Canada
G7A 1B1
Phone.: (418) 831-2245
Mail: honco@honco.ca
RBQ : 8311-9529-20
Fax: Qué. (418) 831-6302
Website: www.honco.ca

Seal

Date 14-07-2021

A: no de detail / detail no.
B: no de la feuille ou detail exige / sheet no. where detail required
C: no de la feuille ou detaille / sheet no. where detailled

SI — cotes exprimees en millimetres / all dimensions in millimeters

Name of Consultant, Vendor or Contractor

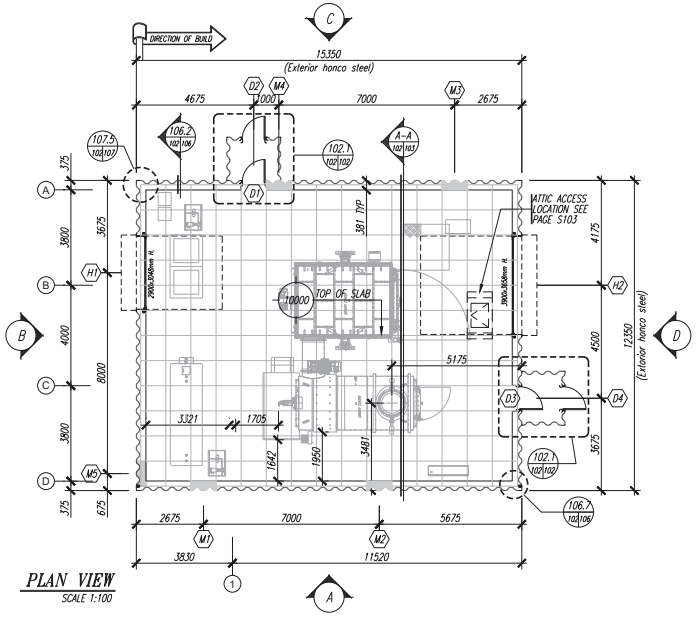
Purchase Order:	Package No.:	Project No.
OP-1056615		
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		

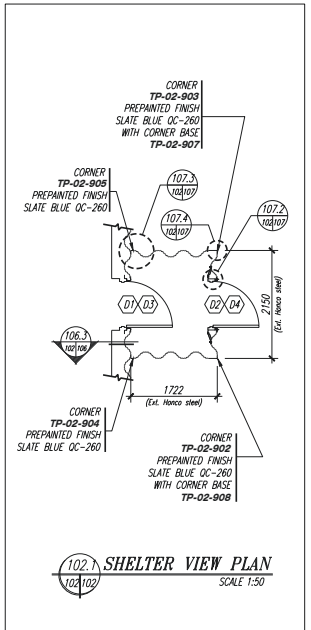
Agnico Eagle Mines Ltd
Meliadine Project, Nunavut, Canada

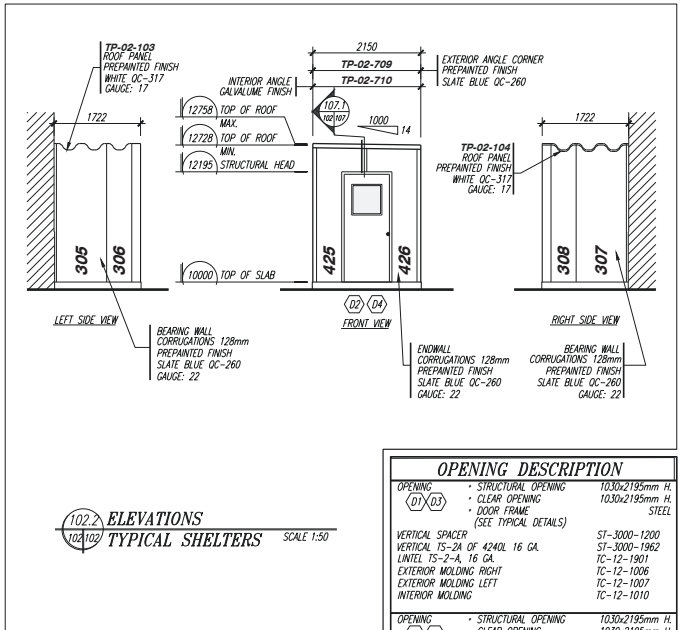
Project Title: INCINERATOR – AREA 428

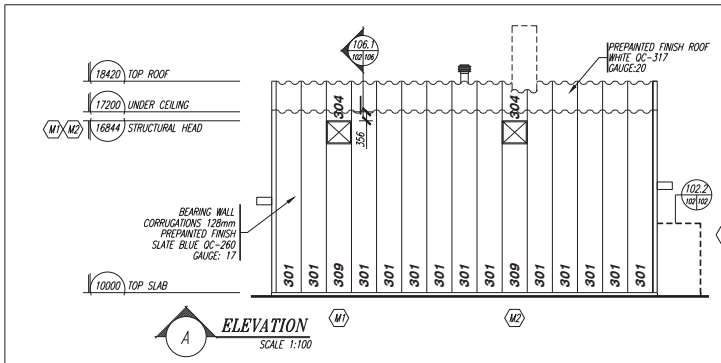
Drawing Title: ANCHOR BOLTS LOCATION

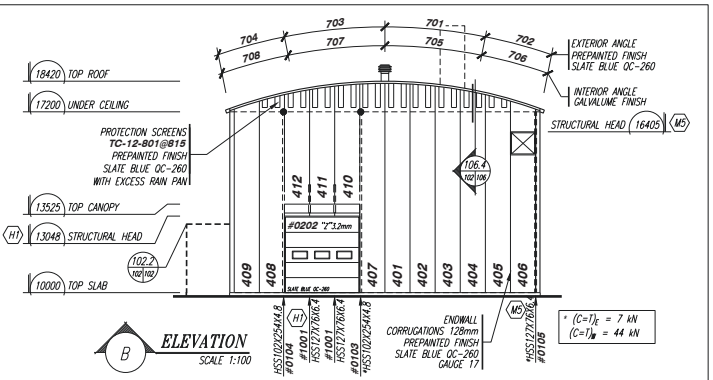
Drawn by:	Checked by:	Approved by:
Date:	Scale:	Revision:
2021-07-05	AS INDICATED	
Client Drawing No.:		Sheet:
		S101

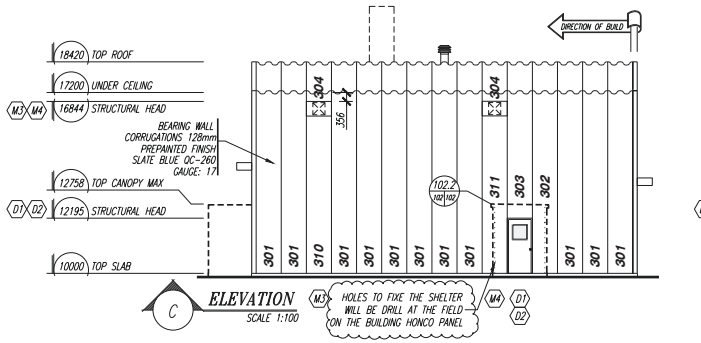


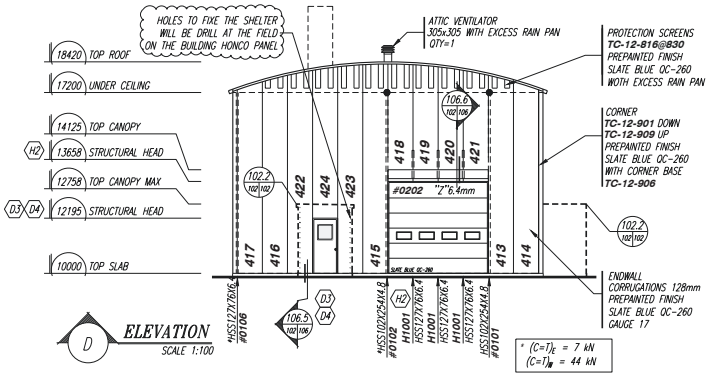












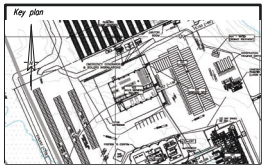
OPENING DESCRIPTION

OPENING D1 D3	• STRUCTURAL OPENING	1030x2195mm H.
	• CLEAR OPENING	1030x2195mm H.
	• DOOR FRAME (SEE TYPICAL DETAILS)	STEEL
VERTICAL SPACER		ST-3000-1200
VERTICAL TS-2A OF 4240L 16 GA.		ST-3000-1962
LINTEL TS-2-A, 16 GA.		TC-12-1901
EXTERIOR MOLDING RIGHT		TC-12-1006
EXTERIOR MOLDING LEFT		TC-12-1007
INTERIOR MOLDING		TC-12-1010
OPENING D2 D4	• STRUCTURAL OPENING	1030x2195mm H.
	• CLEAR OPENING	1030x2195mm H.
	• DOOR FRAME (SEE TYPICAL DETAILS)	STEEL
VERTICAL SPACER TS-2		TC-12-1003
VERTICAL TS-2A OF 2640L 16 GA.		TC-12-1004
LINTEL TS-2A, 16 GA.		TC-12-1005
EXTERIOR MOLDING RIGHT		TC-12-1008
EXTERIOR MOLDING LEFT		TC-12-1009
OPENING H1	• STRUCTURAL OPENING	2900x3048mm H.
HSS 102x254x4.8 RIGHT		0103 OTE.:1
HSS 102X254X4.8 LEFT		0104 OTE.:1
LINTEL "Z" 406 H., 3.2mm		0201 OTE.:1
EXTERIOR MOLDING RIGHT		TC-12-1027
EXTERIOR MOLDING LEFT		TC-12-1028
MOLDING UNDER HEAD		TC-12-1013
WOOD MOLDING		ST-3000-5630
BACKING DOOR SPRING		ST-3000-5660
MOTOR BEARING		ST-3000-5670
VERTICAL CEILING BRACKET		ST-3000-1101
OPENING H2	• STRUCTURAL OPENING	3900x3658mm H.
HSS 102x254x4.8 RIGHT		0101 OTE.:1
HSS 102x254x4.8 LEFT		0102 OTE.:1
LINTEL "Z" 406 H., 6.4mm		0202 OTE.:1
EXTERIOR MOLDING RIGHT		TC-12-1011
EXTERIOR MOLDING LEFT		TC-12-1012
MOLDING UNDER HEAD		TC-12-1029
WOOD MOLDING		ST-3000-5630
BACKING DOOR SPRING		ST-3000-5660
MOTOR BEARING		ST-3000-5670
VERTICAL CEILING BRACKET		ST-3000-1101
OPENING M1 M2 M5	• STRUCTURAL OPENING	920x920mm H.
	• CLEAR OPENING WITH SPANDREL PANEL	850x850mm H.
VERTICAL GP-1 4240L CAL.:16		ST-3000-1642
LINTEL GP-1		TC-12-1902
OPENING SILL		TC-12-1903
EXTERIOR MOLDING (RIGHT)		TC-12-1016
EXTERIOR MOLDING (LEFT)		TC-12-1017
SPANDREL PANEL		TC-12-1019
SPANDREL PANEL SUPPORT		TC-12-1020
OPENING M3 M4	• STRUCTURAL OPENING	920x582mm H.
	• CLEAR OPENING WITH SPANDREL PANEL	850x512mm H.
VERTICAL GP-1 4240L CAL.:16		ST-3000-1642
LINTEL TS-1		TC-12-1902
OPENING SILL		TC-12-1903
EXTERIOR MOLDING (RIGHT)		TC-12-1014
EXTERIOR MOLDING (LEFT)		TC-12-1015
SPANDREL PANEL		TC-12-1018
SPANDREL PANEL SUPPORT (HEAD & SILL)		TC-12-1020
SPANDREL PANEL SUPPORT (LEFT & RIGHT)		TC-12-1021

Client

AGNICO EAGLE

Key plan



no.	by	description	date
R0	M.G.	FOR CONSTRUCTION	2021-07-14

Architect

Mechanical

Honco
STEEL BUILDINGS
1190, Chemin Industriel
Lévis, Qc, Canada
G7A 1B1
RBQ : 8311-9529-20
Phone.: (418) 831-2245
Fax: Qué. (418) 831-6302
Mail: honco@honco.ca
Website: www.honco.ca

Seal

Date 14-07-2021

A: no de detail
detail no.
B: no de la feuille ou detail exige
sheet no. where detail required
C: no de la feuille ou detaille
sheet no. where detailed

SI cotes exprimees en millimetres
all dimensions in millimeters

Name of Consultant, Vendor or Contractor		
Purchase Order:	Package No.:	Project No.
OP-1056615		
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		
Agnico Eagle Mines Ltd		
Medialine Project, Nunavut, Canada		

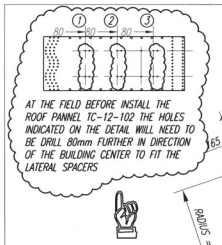
Project Title:

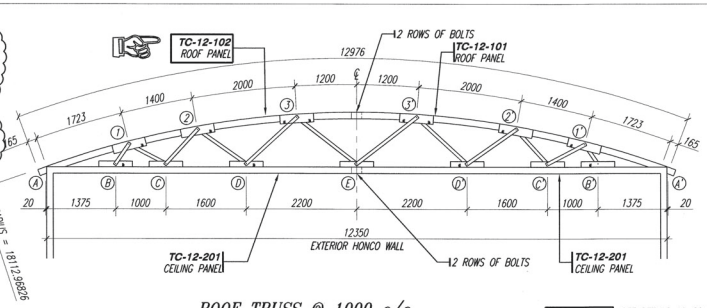
INCINERATOR - AREA 428

Drawing Title:

PLAN VIEW
AND ELEVATIONS

Drawn by:	Checked by:	Approved by:
Date:	Scale:	Revision:
2021-07-05	1:100	
Client Drawing No.:		Sheet: S102





ROOF TRUSS @ 1000 c/c
SCALE 1:50

15 MODULES
14 TRUSS

SEE DETAILS 19-20 FOR TRUSS REINFORCEMENT AT THE CHEMNEY LOCATION

SECURITY GUSSETS FOR WORKERS CEILING LOCATION : B - B'

STRUCTURAL CEILING DEFLECTION -51 +25

1 PANNEAUX DE TOIT / ROOF PANELS

NO. TC-12-	CAL. GA.	LONG. LEN.
101	20	6623
102	20	6623

2 PANNEAUX DE PLAFOND / CEILING PANELS

NO. TC-12-	CAL. GA.	LONG. LEN.
201	22	6435

3 ENTREMISES / LATERAL BRACING

NO. ST-100-	CAL. GA.	LONG. LEN.
2110	16	995
2310	14	1023

NOTE: BRACING LONGER FOR THE END OF ASSEMBLY, ROOF ONLY

4 ENTRETOISES / STRUTS

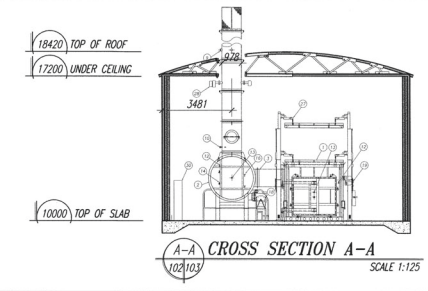
NO. TC-12-		CAL. GA.	LONG. LEN.
B-1	501	18	552
C-1	502	18	913
C-2	503	18	1012
D-2	504	18	1272
D-3	505	18	1449
E-3	506	18	1595

5 GOUSSETS / GUSSETS

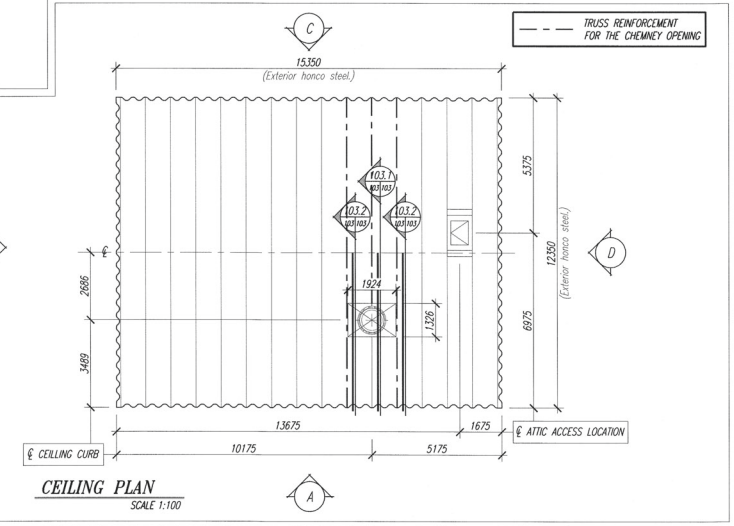
NO. ST-100-	CAL. GA.
B	1114	14
C	1118	18
D	1118	18
E	1118	18
1	1018	18
2	1018	18
3	1018	18

6 DONNEES TECHNIQUES / TECHNICAL DATA

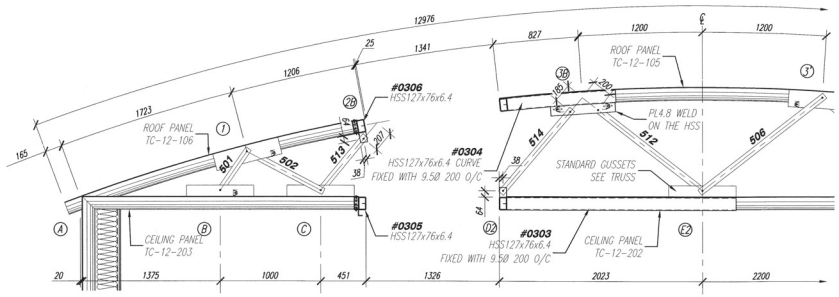
C= 12390	LEGENDE:
A= 40°	C= CORDE
A/2= 20°	A= ANGLE DE REFERENCE
R= 18112.96826	A/2= ANGLE AU TOIT
F= 1092.345656	R= RAYON
Lc= 12645.23734	F= FLECHE
	Lc= LONG.DE LA COURBE



CROSS SECTION A-A
SCALE 1:125



CEILING PLAN
SCALE 1:100



103.1 / 103.103 TRUSS REINFORCEMENT FOR CHEMNEY OPENING
SCALE 1:25

1 PANNEAUX DE TOIT / ROOF PANELS

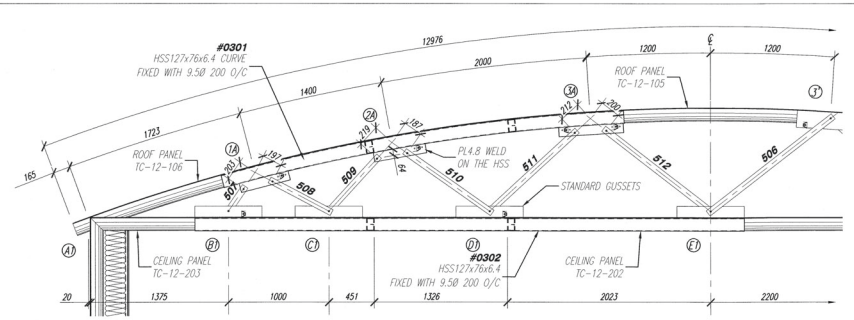
NO. TC-12-	CAL. GA.	LONG. LEN.
105	20	2086
106	20	3018

2 PANNEAUX DE PLAFOND / CEILING PANELS

NO. TC-12-	CAL. GA.	LONG. LEN.
202	22	2082
203	22	2875

4 ENTRETOISES / STRUTS

NO. TC-12-		CAL. GA.	LONG. LEN.	NO. TC-12-		CAL. GA.	LONG. LEN.
B-1	501	18	552	D2-3B	514	18	1119
C-1	502	18	913	3B-E2	512	18	1395
C-2B	513	18	752	E2-3'	506	18	1595



103.2 / 103.103 TRUSS REINFORCEMENT FOR CHEMNEY OPENING
SCALE 1:25

1 PANNEAUX DE TOIT / ROOF PANELS

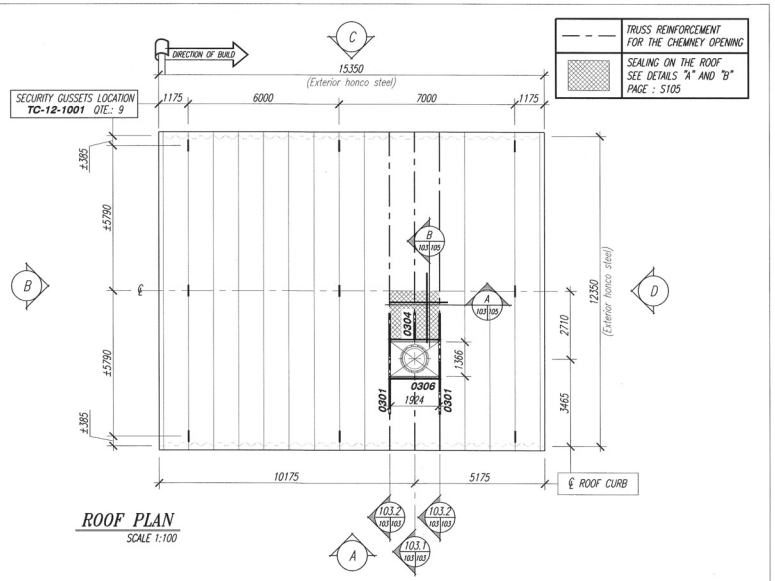
NO. TC-12-	CAL. GA.	LONG. LEN.
105	20	2086
106	20	3018

2 PANNEAUX DE PLAFOND / CEILING PANELS

NO. TC-12-	CAL. GA.	LONG. LEN.
202	22	2082
203	22	2875

4 ENTRETOISES / STRUTS

NO. TC-12-		CAL. GA.	LONG. LEN.	NO. TC-12-		CAL. GA.	LONG. LEN.
B1-1A	507	18	349	D1-3A	511	18	1238
1A-C1	508	18	716	3A-E1	512	18	1395
C1-2A	509	18	793	E1-3'	506	18	1595
2A-D1	510	18	1086				

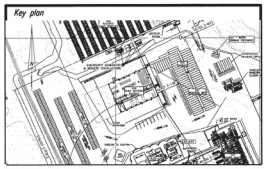


ROOF PLAN
SCALE 1:100

Client

AGNICO EAGLE

Key plan



RD	M.G.	FOR CONSTRUCTION	2021-07-14
no.	by	description	date

Architect

Mechanical

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Website: www.honco.co

Seal

Date 14-07-2021

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SI coles exprimees en millimetres / all dimensions in millimeters

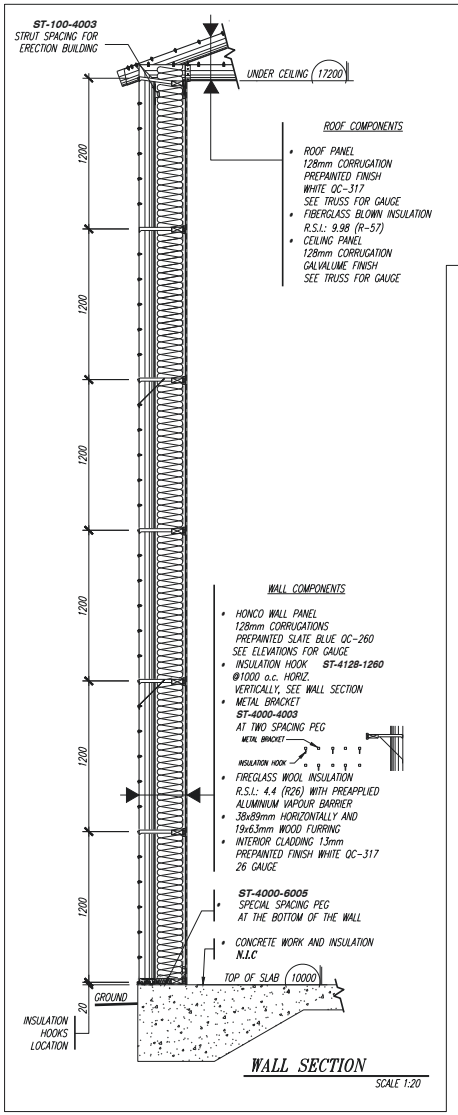
Name of Consultant, Vendor or Contractor		
Purchase Order:	Package No.:	Project No.
OP-1056615		
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		
Agnico Eagle Mines Ltd		
Medialine Project, Nunavut, Canada		
Project Title:		
INCINERATOR - AREA 428		
Drawing Title:		
TRUSS AND CHEMNEY OPENING		
Drawn by:	Checked by:	Approved by:
Date:	Scale:	Revision:
2021-07-05	AS INDICATED	
Client Drawing No.:		Sheet: S103

S103-SIM-5105-TRUSS & WALL SECTION-R0.dwg

LOCATION OF TAPES, BOLTS AND FOAM STRIPS IN THE CONSTRUCTION OF THE BUILDING TC, TP-3000, TP-4000

DESCRIPTION	LOCATION
Sealant tape, 6x6mm	- For each longitudinal overlap of the roof panels.
	- For each end-to-end overlap of the roof panels.
	- For each longitudinal overlap of the ceiling panels.
	- For each end-to-end overlap of the ceiling panels.
	- For the joint between the ceiling connector and the end wall panels.
	- For the joint between the ceiling flashing and ceiling panels.
	- For the joint between the ceiling flashing and the interior liner.
Sealant tape, 3x3mm	- For the longitudinal overlap of the wall panels, panels fully sealed.
	- For the joint between end wall panels and the protection screens, (each side of screen).
Tube of caulking for inside joints	- For the inside joint between the wall-ceiling assembly (TC & TP buildings).
	- For the inside joint between the bearing wall-roof assembly, (for TP type of buildings only - follow the corrugation of the panels).
	- Between the weatherlight membrane and the top of foundation wall, seal with a line of caulking.
Bolts, 3/8"ø x 7/8" long with white nylon washer	- For roof panels assembly.
	- For wall panels assembly.
	- For ceiling panels to bearing wall panels assembly (attic).
	- For exterior use, except otherwise noted (see bolts 3/8" ø x 1-5/16").
Bolts, 3/8"ø x 7/8" long without washer	- For ceiling panels assembly.
	- For gussets plates to lateral spacers assembly.
	- For gussets plates to struts assembly (for TP type of buildings only).
	- For inside use, except otherwise noted (see bolts 3/8" ø x 1-5/16").

DESCRIPTION	LOCATION
Bolts, 3/8"ø x 1- 5/16" long with white nylon washer	- For roof-ceiling-bearing wall panels assembly (for TC type of buildings only).
	- For wall panels to interior-exterior anchor base.
	- For assembly of lateral spacers with ceiling panels
	- For exterior angle/interior angle to end wall panels assembly.
	- For exterior or interior assembly where there are (3) material thicknesses or more such as in the longitudinal overlap of roof panels to gusset plates, longitudinal overlap of ceiling panels to gusset plates, etc.
Bolts 3/8" ø x 1-5/16" long with white nylon washer + 3/8"ø metal/rubber washer	- For lateral spacer to roof panels assembly.
	- For exterior assembly where there are (3) material thicknesses or more (if needed).
3/8"ø metal/rubber washer	- To seal drilled holes widened by the use of punch.
Bolts 1/2" ø x 1" long without washer (for TC only) If bolts 5/8"ø and 3/4"ø are supplied see roof truss drawing	- For struts to gussets plates assembly and crossing of 2 struts.
Foam tape, 6x10 mm (self-adhesive) FoamFlex #1820-4S-Black Polyester-Polyurethane	- For the joint between the wall panels and the anchor base.
Foam tape, 12x20mm (weatherstrip) FoamFlex #2542-4S-Black Polyethylene	- On each side of the anchor bolts, between the foundation wall and the weatherlight membrane.
Foam tape, 22x140mm (weatherstrip)	- Under the roof exterior angle of the end walls.
Foam tape, 12x127mm (weatherstrip) FoamFlex #2542-4S-Black Polyethylene	- Under the base of all openings.



WALL SECTION

SCALE 1:20

Certificate of Design and Manufacturing Conformance with NBC 2015

This Certificate is to affirm that all components of the Steel Building System described below, to be supplied by the named Manufacturer certified in accordance with CSA-A660, have been or will be designed and fabricated in accordance with the following Stardards to carry the loads and load combinations specified.

1. DESCRIPTION

Manufacture's Name and Address: HONCO STEEL BUILDINGS, 1190 CH INDUSTRIEL, LEVIS, QC G7A 1B1
Manufacturer's Certificate No. under CSA A660: HONCO0
Customer Order Number: SK-NU-21-7654-C1470
Building Type and Size: TC, 12,35 M X 15,35 M X 7,20 M
Intended Use and Occupancy: INCINERATEUR
Importance Category (NBC, Sentence 4.1.2.1.(3)): NORMAL
Site Location: MELVILDINE MINES
Applicable Building Code: NATIONAL BUILDING CODE OF CANADA 2015
Builder's Name and Address:
Owner's Name and Address: AGNICO EAGLE MINES, 1957, 3E AVENUE, VAL D'OR (QUÉBEC) J9P 7B2

Engineer's Initials*

2. DESIGN STANDARDS

National Building Code of Canada 2015, Part 4: Structural Design
CAN/CSA-S16-14, Design of Steel Structures
CAN/CSA-S136-12 North American Specification for the Design of Cold-Formed Steel Structural Members
Other (specify): _____ dated _____

3. MANUFACTURING STANDARDS

(a) Fabrication has been, or will be, in accordance with CAN/CSA-S16 and CAN/CSA-S136, as applicable.
(b) Welding has been or will be performed in accordance with CSA-W59 and CAN/CSA-S136, as applicable.
(c) The Manufacturer has been certified in accordance with CSA-W47.1, for Division 1 or 2 and/or CSA-W55.3 if applicable.
(d) Welders have been qualified in accordance with CSA-W47.1.

4. PURLIN STABILITY

Purlin braces are provided in accordance with CAN/CSA-S136, Clause D3 and Appendix B, Clause D3.2.2. In particular, for a standing seam roof supported on movable clips, braces providing lateral support to both top and bottom purlin flange have been or wil be provided. The number of rows is determined by analysis bui in no case is less than 1 for spans up to 7m inclusive or less than 2 for spans greater than 7m.

5. LOADS

(a) Snow and Rain Loac
1-in-50 year ground snow load, Ss, 3,0 (kPa)
1-in-50 year associated rain load, Sr, 0,2 (kPa)
Wind exposure factor Cw, 1,0
Importance factor, Is, 1,0 (kPa)
Roof snow load, S, 2,6 (kPa)
Drift load considered (NBC Sub-section 4.1.6.2.8) refer to drawing of specific building
Specified rain load (NBC, Article 4.1.6.4) 65 (mm)

*Initial each true statement. Mark N/ A if statement does not apply.

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Engineer's Initials*

(b) Full and Partial Snow Load
(i) Applied on a sy one and any two adjacent spans of continuous purlins.
(ii) Applied on a sy one and any two adjacent spans of modular rigid frames with continuous roof beams.
(iii) Applied as discribed for the building geometry in NBC, Article 4.1.6.3 et 4.1.6.10

(c) Wind Load
1-in-50 year reference velocity pressure 0,60 (kPa)
Importance facto; Iw, 1,0

(d) Wind Load Application
(i) Applied as per NBC, Part 4, Sub-section 4.1.7.
(ii) External pressure coefficients per NBC, Article 4.1.7.6. and Figures 4.1.7.6.-A thru 4.1.7.6. -H
(iii) Building internal pressure coefficients 2 per NBC, Article 4.1.7.7.

(e) Crane Loads (where applicable)
Type (top-running) (under-running) (jib)
Capacity (tonnes)
Wheel base (m)
Maximum static, vertical wheel load (kN)
Vertical impact factor
Lateral factor (%) lateral wheel load (kN)
Longitudinal factor (%)maximum longitudinal load (kN/side)

(f) Mezzanine Live Load (kPa)

(g) Earthquake Loac
Applied as per NBC, Part 4, Sub-section 4.1.8
Sa (0,2) 0,066 Sa (0,5) 0,047 Sa (1,0) 0,028
Sa (2,0) 0,014 Sa (5,0) 0,003 Sa (10,0) 0,001 PGA 0,038
F 1,0 F 1,0 F 1,0

(h) Other Live Loads (specify) :

(i) Dead Loads
Dead load of building components is incorporated it the design
Collateral load (mechanical, electrical, ceiling, sprinklers, etc) 0,25 (kPa)
Mezzanine (kPa)
Other (specify) ( )

(j) Load Combinations
Applied in accordance with NBC, Part 4 Section 4.1.

6. GENERAL REVIEW DURING CONSTRUCTION

The Manufacturer does not provide general review during construction for regulatory purposes.

7. CERTIFICATION BY ENGINEER

I DAVID DAMPHOUSSE, a Professional Engineer registered or licensed to practice in the Province or Territory of NUNAVUT hereby cetify that I have reviewed the design and manufacturing process for the steel building system described. I cerify that the foregoing statements, initialed by me, are true.

Name DAVID DAMPHOUSSE, ENG
Title PRESIDENT
Affiliation PROFESSIONAL ENGINEERS OF ONTARIO
Professional Seal
Signature
Date 14-07-2021

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GENERAL NOTES (STRUCTURE):

1. STANDARDS:

.1 NATIONAL BUILDING CODE OF CANADA, AND SUPPLEMENTS, ASSOCIATED COMMITTEE OF NATIONAL BUILDING CODE, NATIONAL COUNCIL FOR RESEARCH CANADA, EDITION 2015.
.2 STEEL STRUCTURE FOR BUILDINGS - LIMIT STATE DESIGN, CAN/CSA-S16-14, CANADIAN STANDARDS ASSOCIATION, REXDALE.
.3 COLD FORMED STEEL STRUCTURAL MEMBERS CAN/CSA-S136-16, CANADIAN STANDARDS ASSOCIATION, REXDALE.
.4 WELDED STEEL STRUCTURES, W59 - LAST EDITION, CANADIAN STANDARDS ASSOCIATION.

2. DESIGN LOADS:

ROOF DEAD LOAD CEILING AND STRUCTURAL COMPONENT	Cm	0.40	KPa
GROUND SNOW LOAD	Ss	3.0	KPa
RAIN LOAD	Sr	0.20	KPa
PRESSURE OF WIND	Q 1/50	0.60	KPa
SEISMIC DATA	Sa(0.2)	0.066	
	Sa(0.5)	0.047	
	Sa(1.0)	0.028	
	Sa(2.0)	0.014	
	Sa(5.0)	0.0030	
	Sa(10.0)	0.0010	
	PGA	0.038	
	PGV	0.035	
AUXILIARY DEAD LOAD		0.25	KPa
ROOF SNOW LOAD	SI	2.60	KPa
ROOF DEFLECTION	L/240		

3. MATERIALS:

STRUCTURAL STEEL THICKNESS ≤ 2.28mm

.1 PREPAINTED STEEL: CONFORM TO ASTM-A653 M-06a, WITH GALVANIZED PROTECTION Z275, GRADE 40, CHOICES OF COLOURS FROM HONCO STANDARD COLOUR CHART TAKEN FROM DOFASCO, SERIE 8000+.
.2 UNPAINTED STEEL: GALVALUME PLUS AZM 165 CONFORM TO ASTM-A792 M-06a, GRADE 40 OR 37.
.3 STEEL COMPONENTS: GALVANIZED STEEL Z275 CONFORM TO ASTM-A653 M-06a, GRADE 40 OR 37.
.4 ASTM-A792/A792M-06a STEEL SHEET, ALUMINIUM-ZINC ALLOY-COATED (GALVALUME) BY THE HOT-DIP PROCESS, PHYSICAL (STRUCTURAL) QUALITY
.5 ASTM-A653/A653M-06a STEEL SHEET, ZINC COATED (GALVANISED) BY THE HOT-DIPPED PROGRESS, PHYSICAL (STRUCTURAL) QUALITY
.6 BOLTED CONNECTIONS: JOINT BY CONTACT WITH 9.5ø BOLTS SAE GRADE 2 BY LELAND

STRUCTURAL STEEL THICKNESS ≥ 2.28 mm

.7 STEEL: C & L SHAPES; PLATES: G40.21M, 300 W ; W: G40.21, 350W. ; TUBULAR SECTION: ASTM A500 GRADE C, Fy=345Mpa
.8 FINISH: 1 PRIMER COAT GREY CPMA 1-73a
.9 BOLTED CONNECTIONS: JOINT BY CONTACT WITH BOLTS ASTM A 325 19 ø EXCEPT WHERE IT SAYS OTHERWISE.
.10 WELDED CONNECTIONS: ACNOR W59-LAST EDITION, E480XX.

4. MODIFICATIONS:

ANY OF THE ELEMENTS CANNOT BE OMITTED OR MODIFIED WHITOUT HONCO'S WRITTEN AUTHORIZATION.

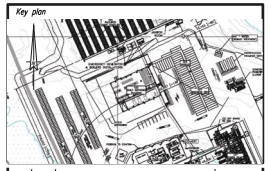
5. TOLERANCES:

THE ERECTION TOLERANCES OF CSA/S16-14 CLAUSE 29.7 MUST BE RESPECTED. (S.I.C.)

Client

AGNICO EAGLE

Key plan



RD	M.G.	FOR CONSTRUCTION	2021-07-14
no.	by	description	date

Architect

Mechanical

HONCO STEEL BUILDINGS
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Lévis, Qc, Canada
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Mail: honco@honco.ca Website: www.honco.ca

Seal

Date 14-07-2021

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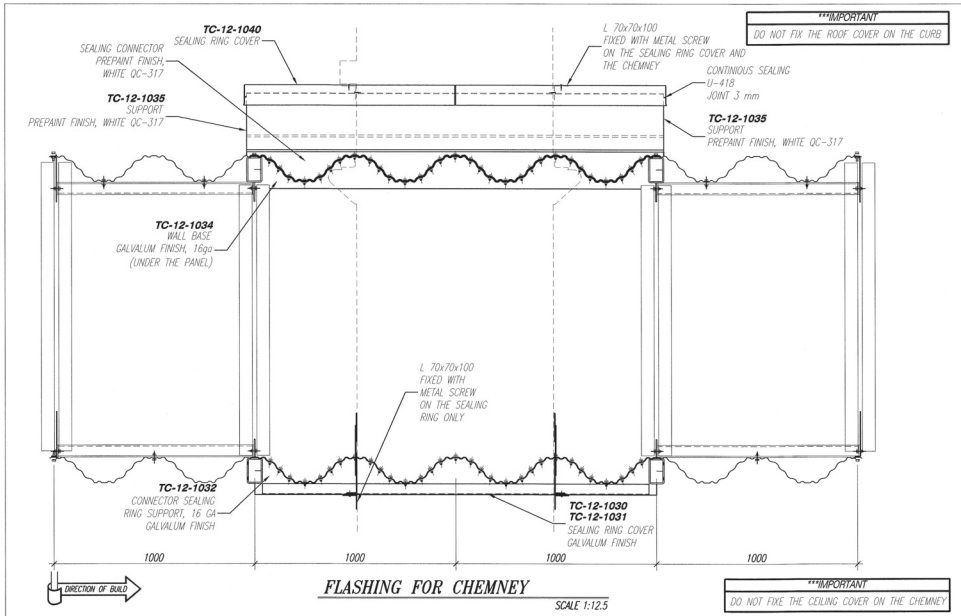
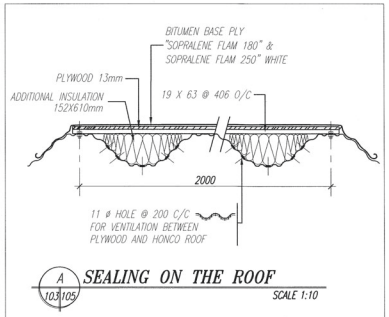
Name of Consultant, Vendor or Contractor		
Purchase Order: OP-1056615	Package No.:	Project No.
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		
Agnico Eagle Mines Ltd		
Medialine Project, Nunavut, Canada		
Project Title: INCINERATOR - AREA 428		
Drawing Title: WALL SECTION		
Drawn by:	Checked by:	Approved by:
Date: 2021-07-05	Scale: AS INDICATED	Revision:
Client Drawing No.:		Sheet: S104

S105-S104-S105-TRUSS & WALL SECTION-AD.dwg



FLASHING FOR CHEMNEY

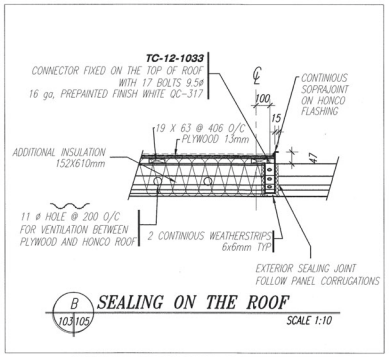
SCALE 1:12.5



A 105 105

SEALING ON THE ROOF

SCALE 1:10



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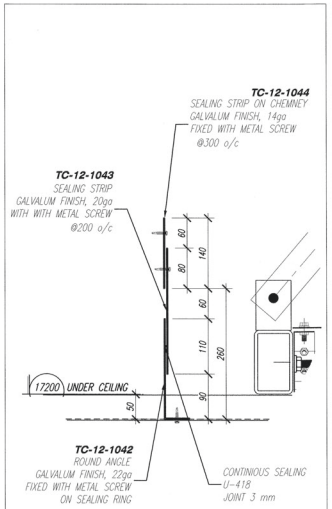
SEALING ON THE ROOF

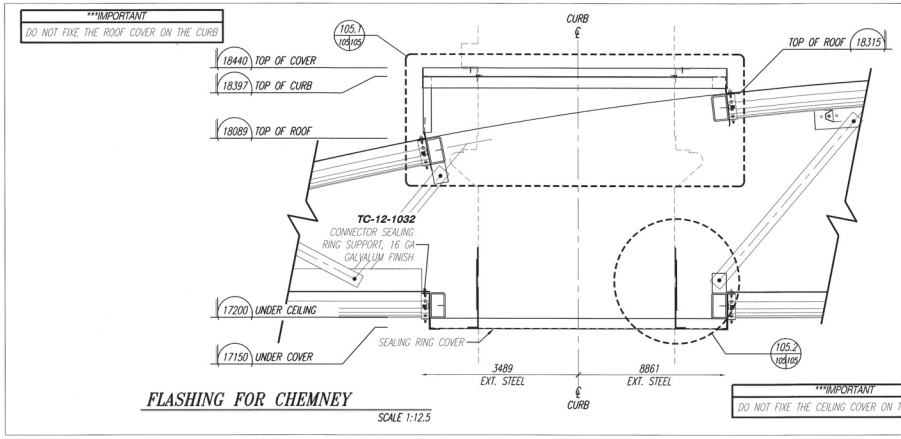
SCALE 1:10



105.2 105 105

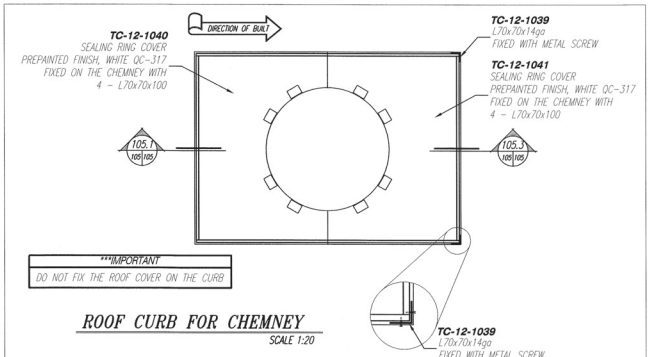
SEALING DETAILS ON CEILING

SCALE 1:5



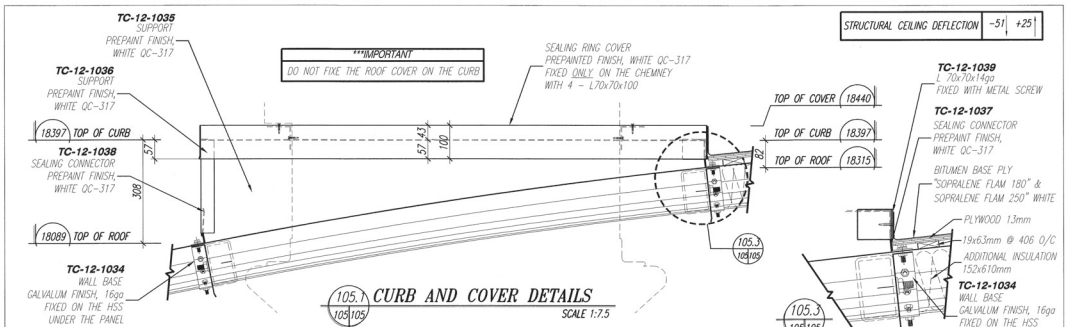
FLASHING FOR CHEMNEY

SCALE 1:12.5



ROOF CURB FOR CHEMNEY

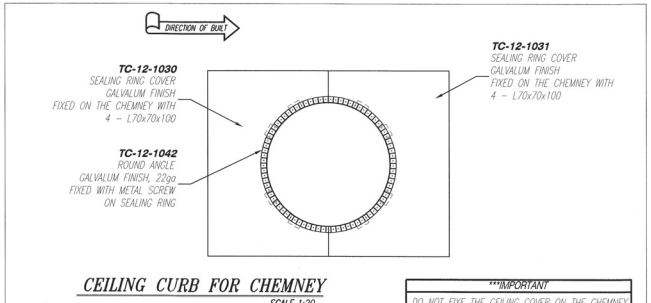
SCALE 1:20



105.1 105 105

CURB AND COVER DETAILS

SCALE 1:7.5



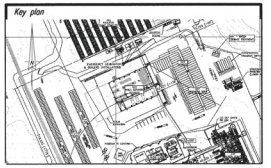
CEILING CURB FOR CHEMNEY

SCALE 1:20

Client

AGNICO EAGLE

Key plan



RD	M.G.	FOR CONSTRUCTION	2021-07-13
no.	by	description	date

Architect

Mechanical

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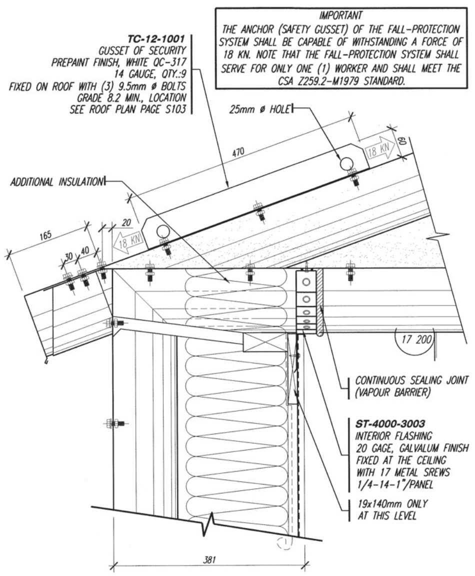
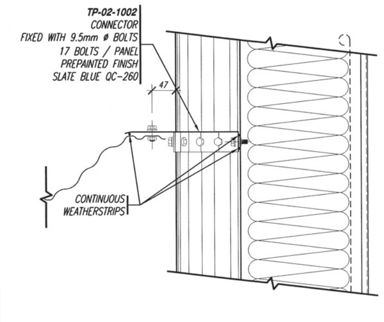
Agnico Eagle Mines Ltd		
Medialine Project, Nunavut, Canada		
Project Title: INCINERATOR – AREA 428		
Drawing Title: CHEMNEY OPENING AND DETAILS		
Drawn by:	Checked by:	Approved by:
Date: 2021-07-05	Scale: AS INDICATED	Revision:
Client Drawing No.:		Sheet: S105

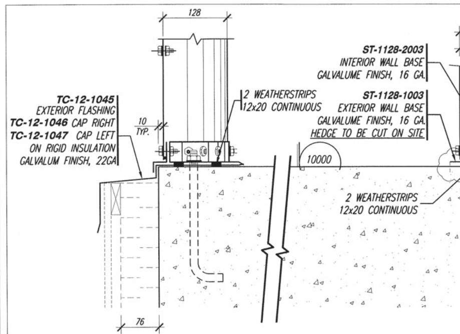
7654-CHM-S105-PROG & WALL SECTION-R0.dwg



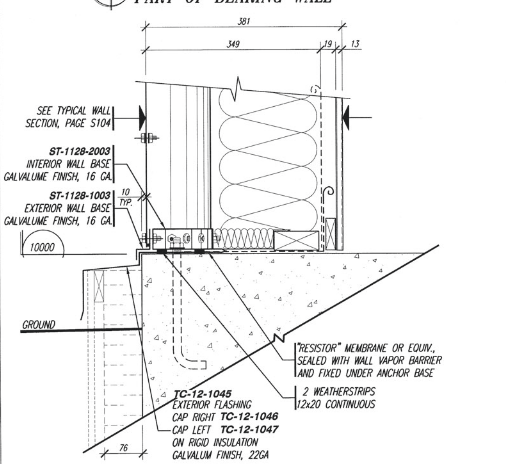
106.1 ASSEMBLY FOR UPPER PART OF BEARING WALL (102|106) SCALE 1:5



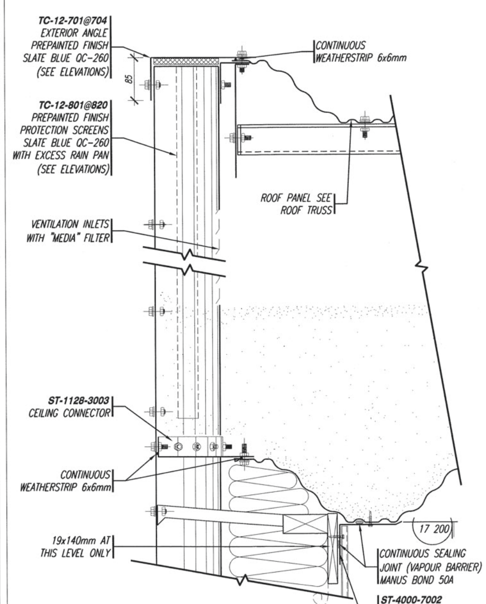
106.3 CONNECTION BETWEEN ROOF AND MAIN BUILDING OF SHELTERS (102|106) SCALE 1:5



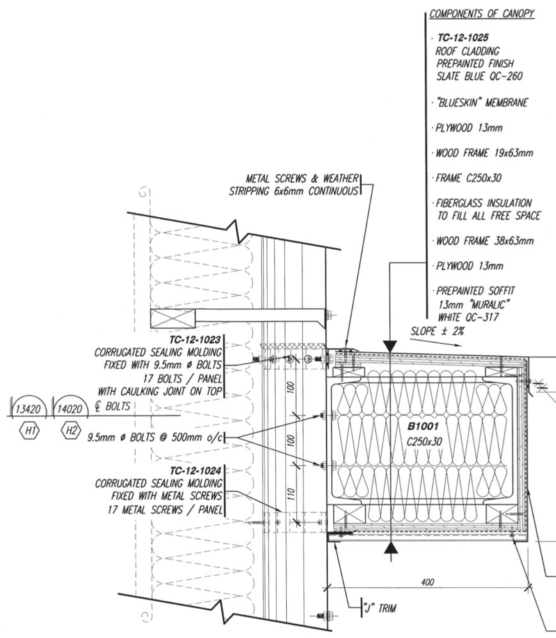
106.5 SHELTER WALL BASE (102|106) SCALE 1:5



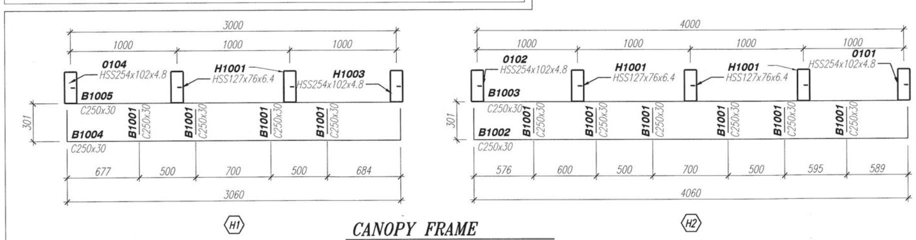
106.2 TYPICAL WALL BASE (102|106) SCALE 1:5



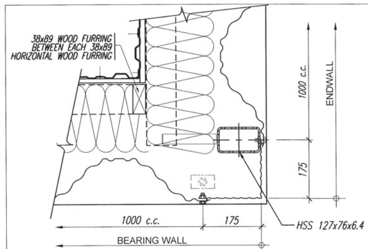
106.4 ROOF & CEILING ASSEMBLY WITH BEARING WALL (102|106) SCALE 1:5



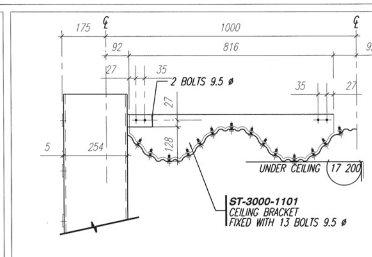
106.6 CANOPY (102|106) SCALE 1:5



CANOPY FRAME SCALE 1:20



106.7 CORNERS DETAILS FOR MAIN BUILDING (102|106) SCALE 1:5

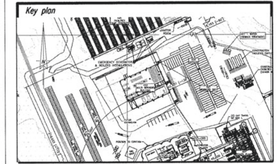


VERTICAL CEILING BRACKET SCALE 1:10

Client

AGNICO EAGLE

Key plan



R0	M.C	FOR CONSTRUCTION	2021-07-14
no.	by	description	date

Architect

Mechanical

HONCO STEEL BUILDINGS

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RBQ : 8311-9529-20

Seal

Date 14-07-2021

A: no de detail / detail no.
B: no de la feuille ou detail exige / sheet no. where detail required
C: no de la feuille ou detaille / sheet no. where detailled

SI — coles exprimees en millimetres / all dimensions in millimeters

Name of Consultant, Vendor or Contractor

Purchase Order:	Package No.:	Project No.
OP-1056615		
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		

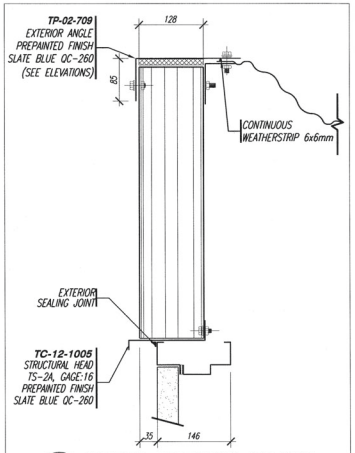
Agnico Eagle Mines Ltd
Meliadine Project, Nunavut, Canada

Project Title: INCINERATOR - AREA 428

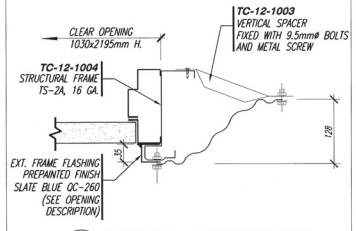
Drawing Title: DETAILS

Drawn by:	Checked by:	Approved by:
Date: 2021-07-05	Scale: INDICATED	Revision:
Client Drawing No.:		Sheet: S106

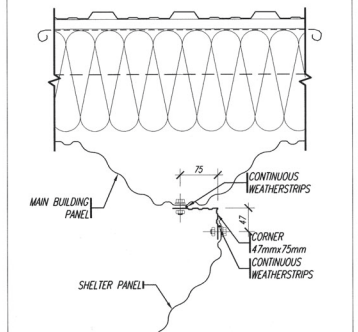
S106-S107-DETAILS-R0 (C1470).dwg



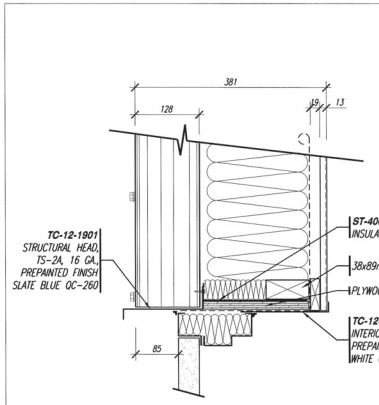
107.1 / 102.107 **HEADER ASSEMBLY ON NON-INSULATED WALL FOR STEEL DOOR** ⟨D2⟩⟨D4⟩ SCALE 1:5



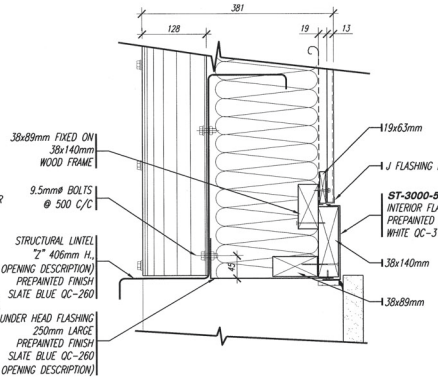
107.2 / 102.107 **VERTICAL ASSEMBLY FOR STEEL DOOR** ⟨D2⟩⟨D4⟩ SCALE 1:5



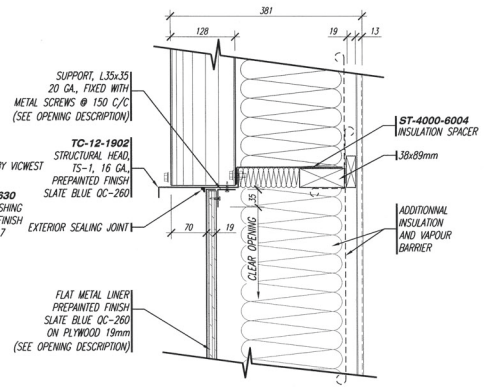
107.3 / 102.107 **CONNECTION BETWEEN SHELTER AND MAIN BUILDING** SCALE 1:5



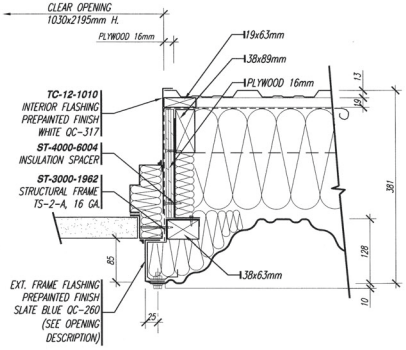
HEAD ASSEMBLY FOR STEEL DOOR ⟨D1⟩⟨D3⟩ SCALE 1:5



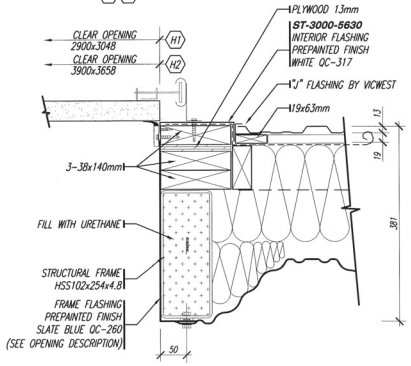
HEADER ASSEMBLY FOR OVERHEAD DOOR ⟨H1⟩⟨H2⟩ SCALE 1:5



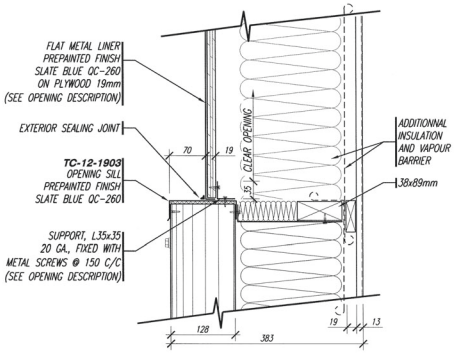
HEADER ASSEMBLY FOR SPANDREL PANEL ⟨M1⟩ @ ⟨M4⟩ SCALE 1:5



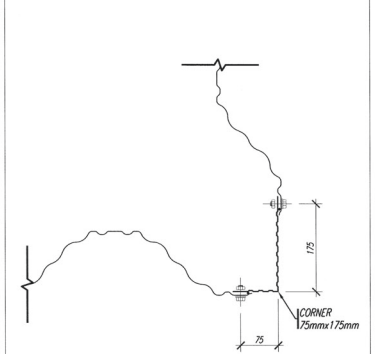
VERTICAL ASSEMBLY FOR STEEL DOOR ⟨D1⟩⟨D3⟩ SCALE 1:5



VERTICAL ASSEMBLY FOR OVERHEAD DOOR ⟨H1⟩⟨H2⟩ SCALE 1:5

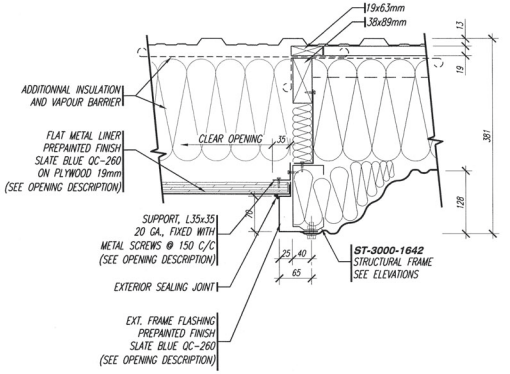


SILL ASSEMBLY FOR SPANDREL PANEL ⟨M1⟩ @ ⟨M4⟩ SCALE 1:5



107.4 / 102.107 **TYPICAL CORNER DETAIL** SCALE 1:5

107.5 / 102.107 **TYPICAL CORNERS DETAILS FOR MAIN BUILDING** SCALE 1:5

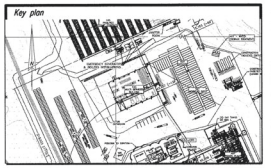


VERTICAL ASSEMBLY FOR SPANDREL PANEL ⟨M1⟩ @ ⟨M4⟩ SCALE 1:5

Client

AGNICO EAGLE

Key plan



RD	M.G.	FOR CONSTRUCTION	2021-07-13
no.	by	description	date

Architect

Mechanical

Honco
STEEL BUILDINGS
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Website: www.honco.ca

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Date 19-07-2021

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Purchase Order:	Package No.:	Project No.
OP-1056615		
Drawing Vendor No.:		Revision No.:
SK-NU-21-7654-C1470		
Agnico Eagle Mines Ltd		
Medialine Project, Nunavut, Canada		
Project Title:		
INCINERATOR - AREA 428		
Drawing Title:		
OPENINGS DETAILS		
Drawn by:	Checked by:	Approved by:
Date:	Scale:	Revision:
2021-07-05	INDICATED	
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		S107

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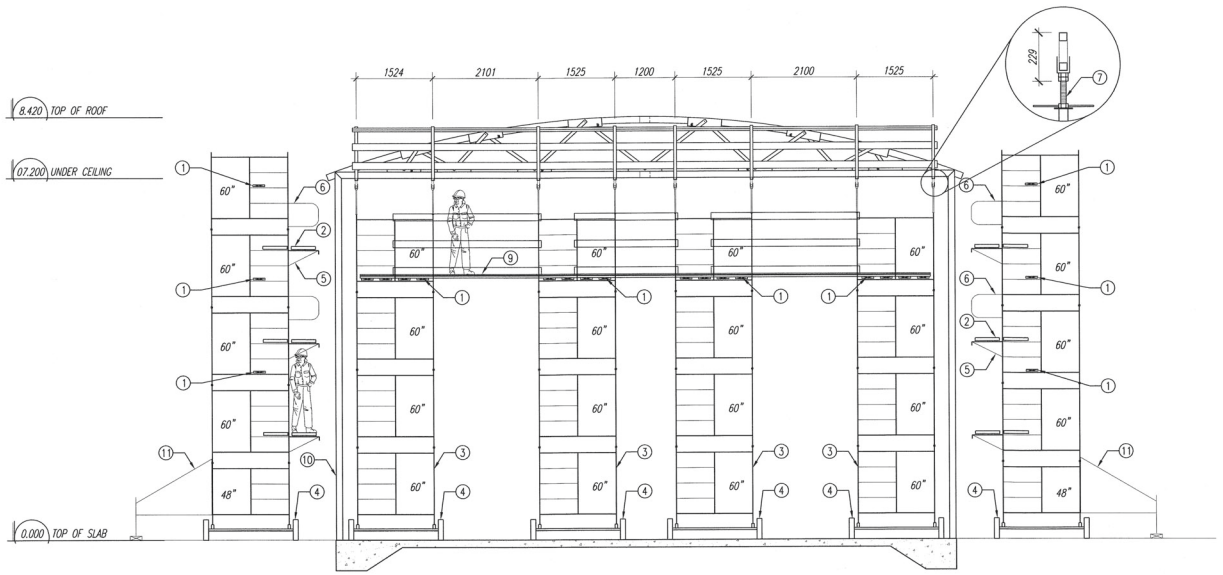


CROSS SECTION SCAFFOLDING

SCALE 1:50

NOTES :

- LES ÉCHAFAUDAGES DEVRONT ÊTRE EN ACIER EN CONFORMITÉ AVEC LE TABLEAU 1 DE LA NORME CSA-S269.2 (DERNIÈRE ÉDITION).
  /THE STEEL MEMBER SCAFFOLDING MUST BE IN CONFORMITY WITH TABLE 1 OF CSA-S269.2 STANDARD (LAST EDITION).
- LA SURFACE DE ROULEMENT ET LE SUPPORT DES ÉCHAFAUDAGES DOIVENT ÊTRE SUFFISAMENT COMPACTÉS (95% DU P.M) AFIN D'ÉVITER TOUT RENVERSEMENT DE L'ÉCHAFAUDAGE.
  /RUNNING SURFACE AND THE SUPPORT OF THE SCAFFOLDINGS MUST BE COMPACTED ADEQUATLY TO AVOID ANY TRUN-OVER OR UNSETTLING OF THE SCAFFOLDING.
- L'ENTREPRENEUR DOIT SE CONFORMER AU CODE DE SÉCURITÉ SUR LES CHANTIERS DE CONSTRUCTION.
  /THE CONTRACTOR SHOULD CONFORM TO SECURITY CODE ON THE CONSTRUCTION SITE.
- AJOUTER GARDE CORPS AUX ENDROITS APPROPRIES
  /GUARD RAIL CONFORM TO CONSTRUCTION SECURITY CODE

PORTÉ /SPAN	LISSE /GARD RAIL
INFERIEUR A 2.15M /LOWER THAN TO 7'-0"	38 X 89 /2" X 4"
SUPERIEUR A 2.15M /SUPERIOR TO 7'-0"	38 X 140 /2 X 6"

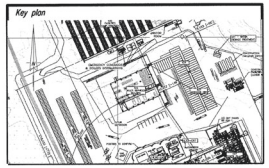
LEGENDE /LEGEND

1. MADRIER /WOOD BEAM
2. PLATE-FORME EN ALUMINIUM 483x3048mm /ALUMINIUM PLATFORM 19"x10'-0"
3. ECHAFAUDAGE /SCAFFOLDING
4. WAGON MOBILE /MOBILE WAGON
5. EQUERRE D'ECHAFAUDAGE /SCAFFOLDINGS SQUARE BRACKET
6. CLOTURE À RESSORT /SECURITY FENCE WITH SPRINGS
7. VIS D'AJUSTEMENT AVEC POUTRELLE D'ACIER /ADJUSTMENT SCREW WITH STEEL JOIST
8. POUTRELLE DE SUPPORT POUR MONTAGE /BEARING JOIST FOR ASSEMBLY
9. CONTREPLAQUE 19mm EPAIS./PLYWOOD 3/4"
10. BATIMENT HONCO /HONCO BUILDING
11. STABILISATEUR /STABILIZER

Client

AGNICO EAGLE

Key plan



no.	by	description	date
R0	M.G.	FOR CONSTRUCTION	2021-07-14

Architect

Mechanical

Honco
STEEL BUILDINGS
1190, Chemin Industriel
Lévis, Qc, Canada
G7A 1B1
RBQ : 8311-9529-20
Phone.: (418) 831-2245 Fax: Qué. (418) 831-6302
Mail: honco@honco.co Website: www.honco.co

Seal

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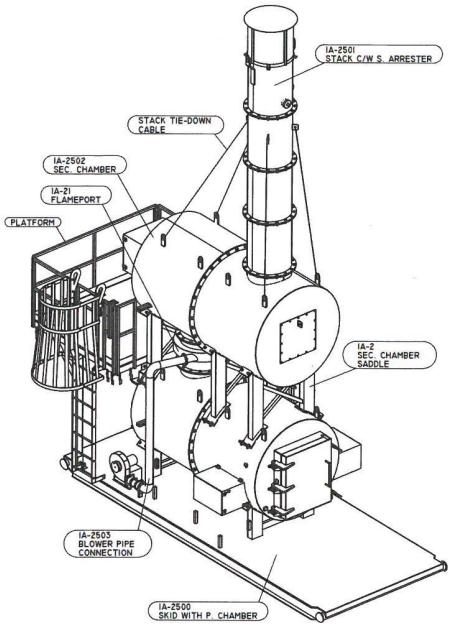
SK-NU-21-7654-C1470		
Agnico Eagle Mines Ltd		
Meadoline Project, Nunavut, Canada		
Project Title:		
INCINERATOR - AREA 428		
Drawing Title:		
SCAFFOLDING		
Drawn by:	Checked by:	Approved by:
Date:	Scale:	Revision:
2021-07-05	1:50	
Client Drawing No.:		Sheet:
		S108

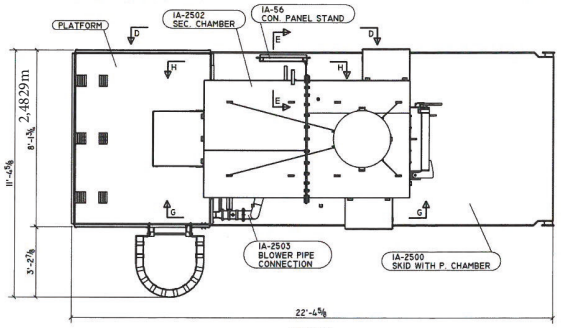
S108-SCAFFOLDING-INCINERATOR

Appendix E: Ketek incinerator manufacturer design specifications

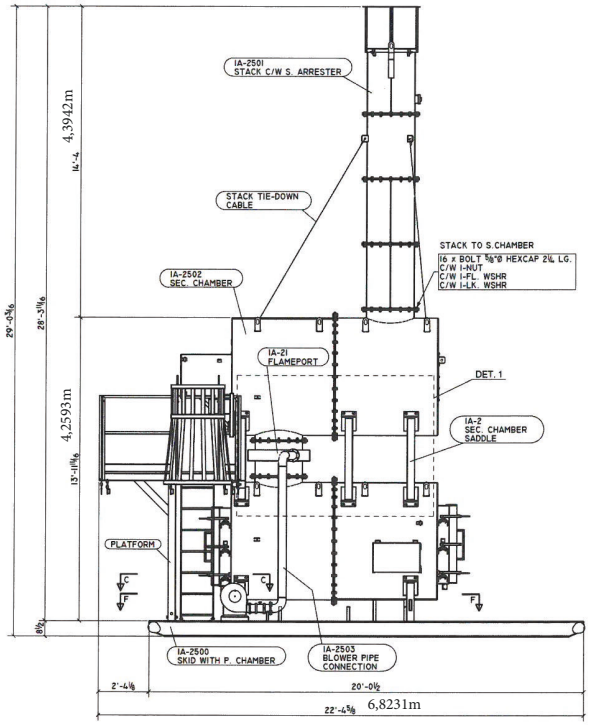
File Name: Ketek Incinerator – CY-100_CA Super Assembly



3D



TOP VIEW



FRONT VIEW

ONE CY-100-CA WITH SEACAN - Mkd - 1A-3500

FOR DETAILS & SECTIONS
REFER TO DWG. IA-3500-1 & IA-3500-2

BILL OF MATERIAL

MARK	TOTAL QTY	UNIT QTY	DESCRIPTION	OUTSOURCED ASSEMBLY	WEIGHT (lbs) QTY UNIT WGT	REMARKS
1A-3500	1	1	CY-100-CA WITH SEACAN			
1A-2	3	3	SEC. CHAMBER SADDLE	-	942.9	
1A-21	1	1	FLAMEPORT	YES	184.5	
1A-35	1	1	ASH SCRAPER	-	11.9	
1A-38	2	2	UNISTRUT	-	1.0	
1A-48	4	4	UNISTRUT	-	2.8	
1A-49	4	4	UNISTRUT	-	2.0	
1A-50	2	2	UNISTRUT	-	1.4	
1A-51	3	3	UNISTRUT	-	2.1	
1A-52	1	1	UNISTRUT	-	1.0	
1A-53	1	1	UNISTRUT	-	0.8	
1A-54	2	2	UNISTRUT	-	2.0	
1A-56	1	1	CON PANEL STAND	-	72.1	
1A-59	1	1	UNISTRUT	-	2.2	
1A-60	1	1	PANEL STAND SUPPORT	-	1.6	
1A-2500	1	1	SKID WITH P.CHMBR	-	8548.	
1A-2501	1	1	STACK C/W S.ARRESTER	-	853.6	
1A-2502	1	1	SEC. CHAMBER	-	3547.	GRADE : 44W
1A-2503	1	1	BLOWER PIPE CON.	-	190.9	
BOUGHT ITEMS						
BIA-100	4	4	TOGGLE CLAMP		0.0	
BIA-101	6	6	BEARING		0.0	
BIA-102	6	6	RBL SHAFT COLLAR		0.0	
BIA-103	1	1	DIRECT-DRIVE BLOWER		35.0	MODEL:4C108
BIA-104	8	8	DOOR CATCH		26.9	
BIA-105	8	8	STRIKER PLATE		9.6	
BIA-106	1	1	BUTTERFLY GAS VALVE		5.0	FOR 4"Ø PIPE
BIA-106	2	2	4"Ø HALF NIPPLE		0.0	(ONE END THREADED
SHOP BOLTS, NUTS & WASHERS						
TOTAL QTY	UNIT QTY	DESCRIPTION	LENGTH	MAT.GRADE	REMARKS	
5	5	5/16"Ø HEXCAP BOLT	0'-1"	Grade 5		
48	48	5/8"Ø HEXCAP BOLT	0'-2 1/2"	Grade 5		
24	24	3/4"Ø HEXCAP BOLT	0'-2 1/2"	Grade 5		
1	1	5/16"Ø HEX NUT		Grade 5		
48	48	5/8"Ø HEX NUT		Grade 5		
2	2	3/4"Ø HEX NUT		Grade 5		
1	1	5/16"Ø FLAT WASHER		Grade 5		
48	48	5/8"Ø FLAT WASHER		Grade 5		
2	2	3/4"Ø FLAT WASHER		Grade 5		
1	1	5/16"Ø LOCK WASHER		Grade 5		
48	48	5/8"Ø LOCK WASHER		Grade 5		
2	2	3/4"Ø LOCK WASHER		Grade 5		
MISC. FASTENERS						
20	20	HOLD DOWN CLIPS WIT SCREW	1.5	S.S.	FISHER & LUDLOW	
17	17	3/8" Ø MANIFOLD STUD	N/A	Grade 5		
TOTAL WEIGHT THIS DRAWING :				14451.0		

Note: Structural components only.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA G.M. SMORDIN 25114 ENGINEER

April 10, 2014

PROFESSIONAL ENGINEER ALBERTA SEBASTIAN MACOVEI 29021

April 10th, 2014

Alberta Permit to Practice No. P06501

GENERAL NOTES:	REV.#	DESCRIPTION	DATE
1.	1	ISSUED FOR FABRICATION	MAR-19-13
2.			
3.			
4.			
5.			

USER: yogi PLOT DATE: 04/09/2014 - 11:09:32

CLIENT:

PROJECT: INCINERATOR CY_100_CA_D

TITLE: CY-100-CA WITH SEACAN

KETEK MANUFACTURING MEMBER OF KETEK GROUP INC.
20204 - 110 AVENUE EDMONTON, AB T5S 1X8
PH : (780) 447-5050 FAX : (780) 447-4912 www.ketekgroup.com

DET.	CHK	Job Nº
YP	MH	
UNITS	SCALE	Drg Nº
INCH	N.T.S	1A-3500

Sheet Nº 1 / 3 — 0

Appendix F: Ketek operation and maintenance manual

File Name: CY-100-CA-Operation Manual

KETEK GROUP

Results Driven.

20204-110 Avenue NW
Edmonton, AB, Canada, T5S 1X8
Phone: 1-855-447-5050
Fax: (780) 447-4912
Email: info@ketek.ca
www.ketek.ca

CY-100-CA

MANUAL

OPERATION & MAINTENANCE

LIST OF TABLES

LIST OF FIGURES

Thank you for selecting Ketek Group to provide you with a reliable, proven and cost-effective system to manage your waste in an environmentally sound manner. This manual has been prepared to allow you to operate and maintain the system safely and efficiently, ensuring its proper operation and continued use for a long time.

It also contains information on the combustion process. We think a good understanding of the basic principles make a knowledgeable, and hence a better, operator.

Table 1 outlines the contents of this manual. We encourage you to read Chapter 2. Chapters 4 and 5 contain the most important information.

TABLE 1 ORGANIZATION OF MANUAL

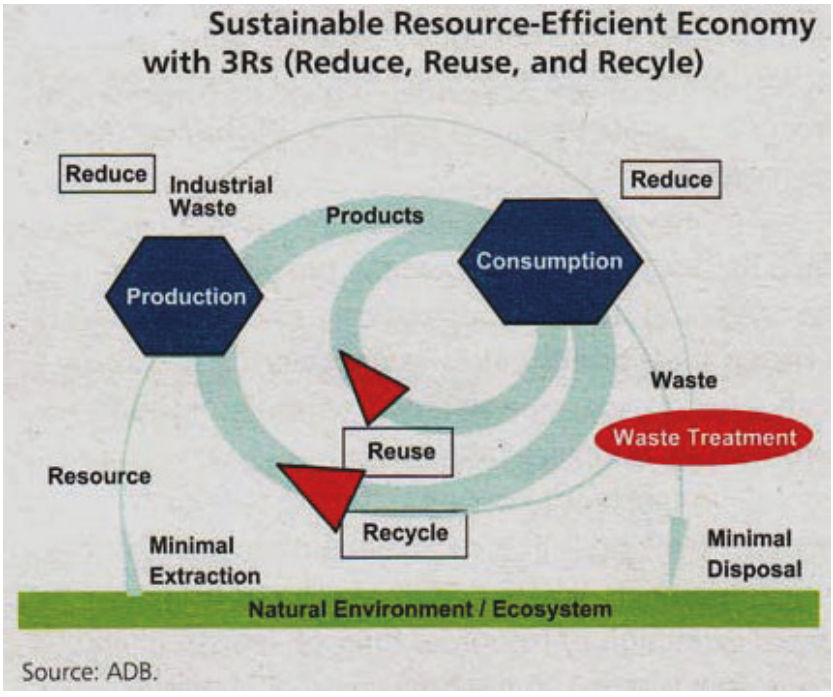
Chapter	Title / Description
2	Waste Incineration and General Guidelines for Waste Management
3	Roles and Responsibilities
4	Principles of waste incineration What incineration is, how it is affected by waste properties, including incinerator capacity and the design and operational features of the system.
5	System Description List of photographs of the components of the system and their functions
6	Operation and Maintenance How to operate and maintain the system, including discussion of safety

Incineration of waste is recognized as an effective and environmentally sound disposal method for a wide range of wastes, provided the incinerator is properly operated and maintained. However, waste segregation, recycling and reuse should be considered before waste is sent for incineration. Examine the waste to determine the opportunities that exist for:

- reducing the overall quantity of waste generated
- reusing materials, and
- recycling as much as possible before disposal

Incineration of waste can lead to the emission of pollutants. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (PCDDF), commonly known as dioxins and furans, can be generated if the incinerator is operated inefficiently and combustion is incomplete. Dioxins and furans are toxic, persistent, and bio-accumulative and therefore must be controlled. Mercury is another high priority potential contaminant released from incinerators. It is toxic and bioaccumulates in the environment. Mercury is not emitted unless the waste items incinerated contain mercury. The best method to control mercury is therefore waste segregation to eliminate mercury from the waste fed into the incinerator.

Waste management and segregation before incineration will help reduce waste and provide cleaner emissions, maintaining an environmentally sound way of disposing waste products.



3.1 Waste management in charge/site services

- Ensure that relevant waste handling training is provided to all waste management personnel at site and only properly trained individuals (Incinerator Operators) operate the incinerator.
- Ensure that the operator follows the requirements of the Incinerator Operational Plan, Equipment Operation Manual and other relevant guidelines.
- Ensure that all checklists and data logs are maintained and the records required by this guidance document are collected.
- Ensure adequate re-training is provided to the operators at regular interval.
- Ensure the safety of all personnel and the site.
- Carry out periodic inspections and record observations in supervision checklist appended in this document.

3.2 Incinerator Operator

- Ensure the safe operation of the incinerator and the associated work and storage area.
- Ensure the operation and maintenance of the incinerator is carried out in accordance with the Equipment Operation Manual.
- Ensure that only appropriate wastes are incinerated, and all inappropriate wastes, including plastics, aerosol cans, metallic containers or cans filled with waste oil, are removed and handled accordingly.
- Document and maintain the required logs and records as appended in the document (pre-operational checklist, operational checklist and waste incineration log).
- Notify the supervisor or waste management in charge of any incinerator upsets, malfunctions or required repairs.
- Wear proper Personal Protective Equipment at all times while working with the incinerator or waste.

3.3 Maintenance Personnel

- Carry out timely Inspections and maintain the records
- Carry out preventive maintenance at scheduled intervals; record and report any unusual observations on the equipment.
- Do not alter the electrical wiring or incinerator components.
- Consult Ketek for any clarifications or guidance related to maintenance of the equipment.
- Fill and record the inspection and maintenance checklist and follow the checklist for weekly, monthly and annual inspection and maintenance
- Make sure to lock out/tag out the unit as per the company's existing procedures if there is a problem.

4.1 Combustion

Combustion, burning, incineration, and thermal oxidation all denote the same process, which is the reaction of a combustible materials with oxygen at temperatures higher than the ignition temperature[1] of that matter. The reaction is exothermic, meaning it generates heat in the form of hot gas.
In the case of waste, it may also contain non-combustible matter which does not react with oxygen. In waste incineration, the non-combustible component ends up as ash and a small portion of it is also present in the hot gas in the form of particulate matter or dust.

Figure 1 shows the process of waste incineration. The oxygen used comes from air, which contains 21% oxygen by volume, and the hot gas is typically referred to as flue gas.

4.2 Why incinerate waste?

The main purpose is to reduce the mass and volume for final disposal. Another important reason, since the waste may contain pathogenic, infectious or toxic materials, is to detoxify it. In remote areas, where wildlife is present, scavenging and spreading of diseases can be prevented by incineration.

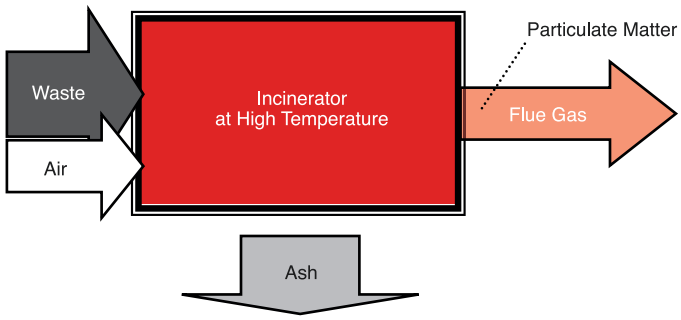


FIGURE 1 SCHEMATIC DIAGRAM OF INCINERATION PROCESS

In some cases, incineration is used to recover the energy contained in the waste in the form of electricity, steam, hot fluids or hot air. In other cases, valuable materials can be recovered from the ash, or the ash as a whole can be used for soil amendment or as a construction material.

4.3 Waste components

There are different ways of characterizing waste, depending on the purpose for doing it. Here, it is sufficient to characterize the components as follows: [2]

A. WATER is an important component because in incineration it has to be evaporated, which requires a lot of energy.[3] That, in turn, lowers the temperature of the flue gas.

B. COMBUSTIBLES are those components that react with oxygen and release heat.[4] The higher the combustible content in the waste, the more air per kilogram of waste is needed for incineration.

This component can be further classified as:

(i) Volatile, which is released to the gas phase when the combustible matter is heated without the presence of oxygen, and
(ii) Fixed carbon which remains in the solid waste after the volatile has been released. This is often referred to as charcoal.

C. NON-COMBUSTIBLE OR ASH is the component that does not react with oxygen.[5] As previously mentioned, this forms ash, and some of it is in the flue gas in the form of particulate matter or dust. If the waste has a high ash content, less waste can be incinerated before ash must be removed from the combustion chamber. Note also if the waste contains metals, such as lead and cadmium, these metals will be present in the ash.

4.4 Heating Value

Heating value, calorific value and heat of combustion are synonyms that quantify the heat released by the combustible component in the waste. An understanding of the concept can be gained from the hypothetical processes shown in Figure 2.

A measured mass of dry waste and a sufficient amount of oxygen, at room temperature, are ignited, and the resulting hot flue gas is passed through a heat exchanger, where heat is extracted until the flue gas is brought back to room temperature. Let M be the mass (kg) of the dry waste, and H (MJ) is the heat extracted from the heat exchanger. The heating value of the dry waste is H/M (MJ/kg).

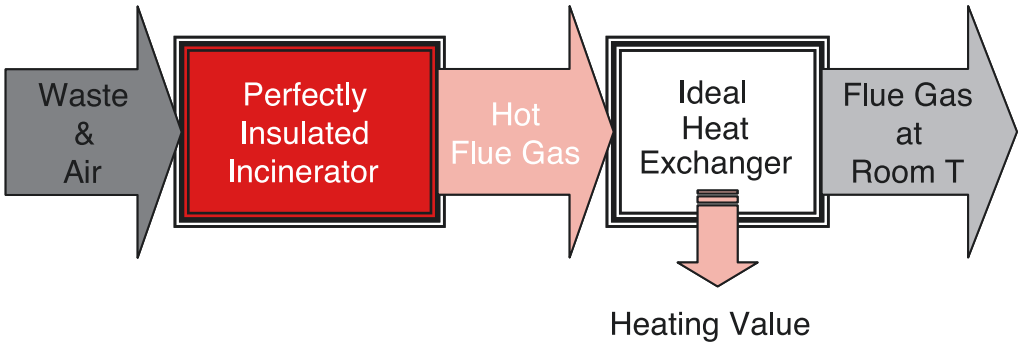


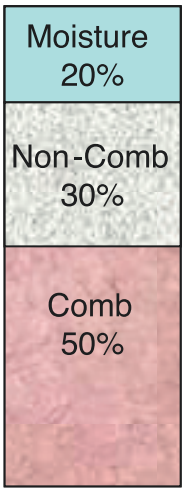
FIGURE 2 THE CONCEPT OF HEATING VALUE

1. Below the ignition temperature, combustion does not take place. Consider, for example, gasoline or wood: it has to be ignited for combustion to take place. That is, the temperature in some portion of the matter must be brought up to the ignition temperature for combustion to start.
2. This is referred to as proximate analysis. Another method is elemental analysis, which produces the elemental composition (C, H, O , N, S, Cl ...) of the waste.
3. It takes ~ 2.3 MJ (2200 BTU or 90 cc of propane or 60 cc of diesel) to evaporate 1 L or 1 kg of water. This is referred to as the latent heat of evaporation.
4. The term "organic" is also used, which is strictly incorrect in that some "inorganic" elements or compounds are combustible, such as carbon, sulphur and carbon monoxide.
5. The terms "ash" and "inorganic" are also used. Note that the latter is inaccurate as explained previously.

4.5 Different Expressions for Heating Value

Two different values are reported in the literature (a) "high" or "gross", and (b) "low" or "net". The former corresponds to the case where the moisture in the flue gas is condensed, and hence the high or gross heating value includes the latent heat of evaporation of the water formed in combustion (see Footnote 3). The latter excludes the latent heat evaporation. The low or net heating value thus represents the maximum available energy that can be recovered from the flue gas without condensation.

To be noted also is the basis on which the heating value is expressed, which can be (a) as fired, (b) dry basis or (c) ash free. The distinction is illustrated in Figure 3. An understanding of the different bases can be gained by noting that heating value is a property of the combustible component in the waste. Water and the non-combustible component simply "dilute" the heating value. In terms of incinerator operation, the relevant basis is "as fired".



* HV as measured:
15 MJ/kg "Dry Basis"

* HV of whole waste:
= (30 + 50)/100 * 15 = 12 MJ/kg "As Fired"

* HV of combustible component:
= (30 + 50)/50 * 15 = 24 MJ/kg "Ash Free"

FIGURE 3 DIFFERENT BASES FOR EXPRESSING HEATING VALUE (HV)

4.6 Examples of waste characteristics

Proximate compositions and heating values of commonly found wastes are given in Table 2.

FIGURE 3 DIFFERENT BASES FOR EXPRESSING HEATING VALUE (HV)

Type*	Description	Componets	Weight %			MJ/kg
			Moist	Comb	Non-C	HHV (A/F)
0	Trash	Paper, cardboard, cartons, wood boxes and combustible floor sweepings from commercial and industrial activities. Up to 10% by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rags and plastic or rubber scraps.	10%	85%	5%	19.7
1	Rubbish	Trash + Type 3 (up to 20%)	25%	65%	10%	15
2	Refuse	Rubbish and Garbage	50%	43%	7%	10
3	Garbage	Animal and vegetable waste, restaurants, hotels, markets, institutional, agricultural waste (ie. plant material), vegetation, commercial and club sources	70%	25%	5%	5.8
4	Animal/ Pathological	Carcasses, organs, hospital and laboratory, abattoir, animal pound, veterinary sources	85%	10%	5%	2.3

Notes:
Moist= moisture, Comb= Combustible; Non-C = Non-combustible; HHV = High Heating Value; A/F = As Fired
* In some cases, Roman numerals are used. That is Types 0, I, II, III and IV

4.7 Incinerator Capacity and Load Size

Incinerator capacity is dependent on waste composition. In general, the higher the heating value, the lower is the capacity in terms of kg/h that can be incinerated. This can be explained by noting that waste that has a higher heating value requires more air per unit mass than that required to incinerate a waste with a lower heating value. To put it another way, for the same amount of air, more mass of a waste with a lower heating value can be incinerated.

Another important consideration is the size of the batch loaded to the incinerator. The higher the heating value, the smaller (lighter) the load should be. Otherwise, insufficient amount of the air would generate black smoke.

Unfortunately, waste composition is not always known. Nevertheless, there may be indications of the components present. To assist in getting a qualitative estimate of the heating value of a batch of waste, the heating values of common generic waste components are shown in Table 3.

TABLE 3 HIGH HEATING VALUES (APPROXIMATE) OF COMMON WASTE COMPONENTS

Component	MJ/kg A/F *	Component	MJ/kg A/F *
Kerosene, diesel ...	44	Leather	16
Plastics	46	Wax paraffin	44
Rubber, latex	23	Rags (linen, cotton)	17
Wood	18	Animal fats	39
Paper	17	Citrus rinds	4
Agricultural waste	17	Linoleum	25

* A/F: As Fired

Another important waste component is the volatile content in the waste. Table 4 shows the proximate components of various materials and wastes.

In general, this component is responsible for smoke generation. Therefore, as in the case with heating value, the higher the volatile content, the smaller the load that should be charged to the incinerator.

TABLE 4 PROXIMATE COMPOSITION OF VARIOUS MATERIALS

Material	Volatile	Moisture	FC	Ash	FC/V
	%wt	%wt	%wt	%wt	-
Coal (bituminous)	30	5	45	20	1.5
Peat	65	7	20	8	0.3
Wood	85	6	8	1	0.1
Paper	75	4	11	10	0.15
Sewage sludge	30	5	20	45	0.66
MSW	33	40	7	20	0.21
RDF	60	20	8	12	0.13
PDF	73	1	3	13	0.04
TDF	65	2	30	3	0.46
PE, PP, PS	100	0	0	0	0
Plastic + Colour	98	0	0	2	0
PVC	93	0	7	0	0.08

Notes:

FC = Fixed Carbon
FCN = Ratio of Fixed Carbon to Volatile
RDF = Refuse Derived Fuel
PDF= Paper Derived Fuel
TDF = Tire Derived Fuel
PE= Polyethylene
PP= Polypropylene
PS = Polystyrene
PVC = Polyvinylchloride

5.1 Overview

Regardless of the model of your incinerator, the main components are similar. Figure 4 shows a schematic diagram of the incineration system. It consists of a Primary Chamber and a Secondary Chamber, which are connected by a flame-port. Combustion air to the Secondary Chamber is delivered via the flame-port by the flame-port blower. Auxiliary burners are provided for start-up and to maintain the minimum temperatures set in the two chambers.

Thermocouples are used to measure the temperatures in the chambers, the outputs of which are used by on-off Omron controllers, which regulate the operation of the auxiliary burners.

The Secondary Chamber combined with high temperatures maintained by the auxiliary burner, and the turbulence created from the delivery of air (oxygen) by the flame-port air blower, ensures that black smoke is not generated (provided the size of the waste load is not too large).

Waste is charged manually and intermittently via the waste charging door (1), and ash is removed manually and batch-wise after operation. The waste charging door is also used to rake the waste in the primary chamber after several loads have been charged, which is necessary to expose the fixed carbon component in the waste to the oxygen.

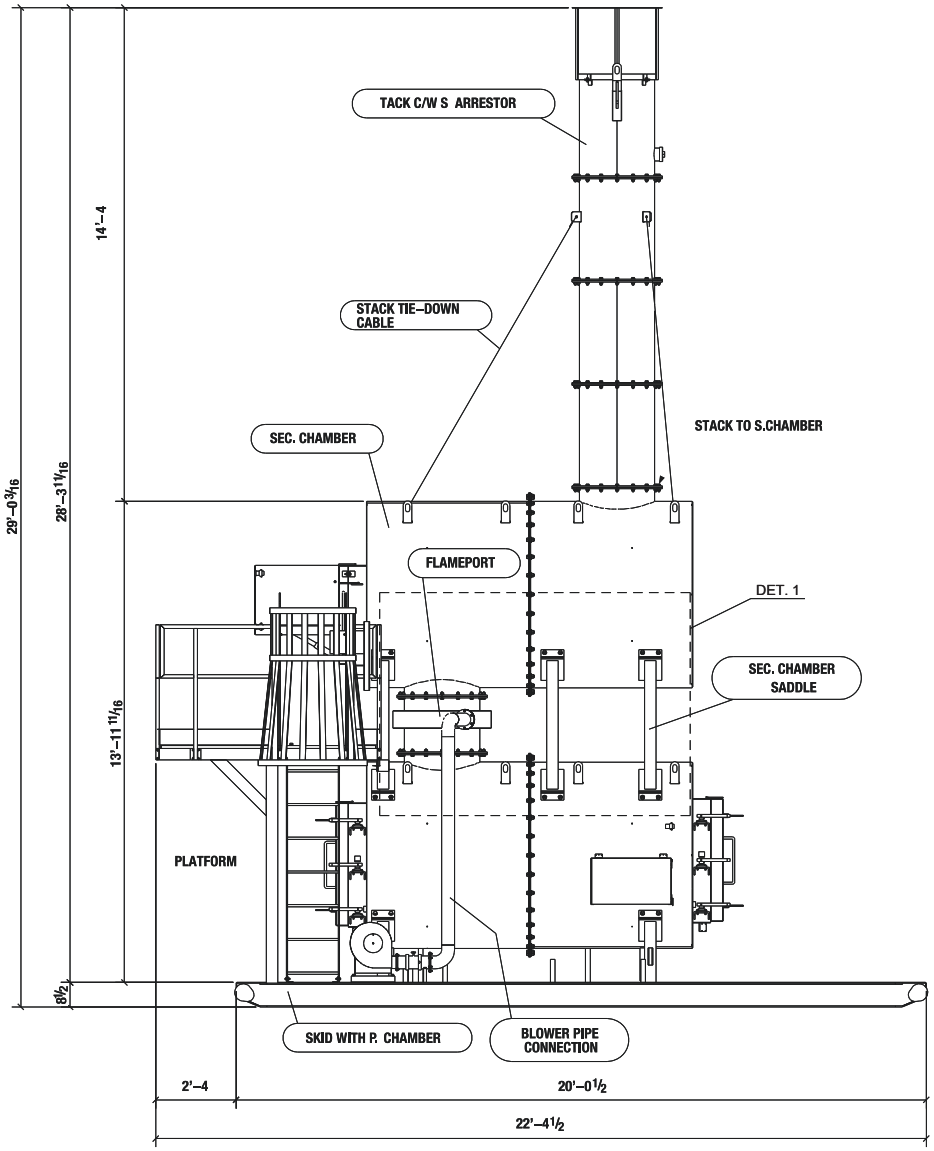


FIGURE 4 SCHEMATIC OF THE INCINERATION SYSTEM

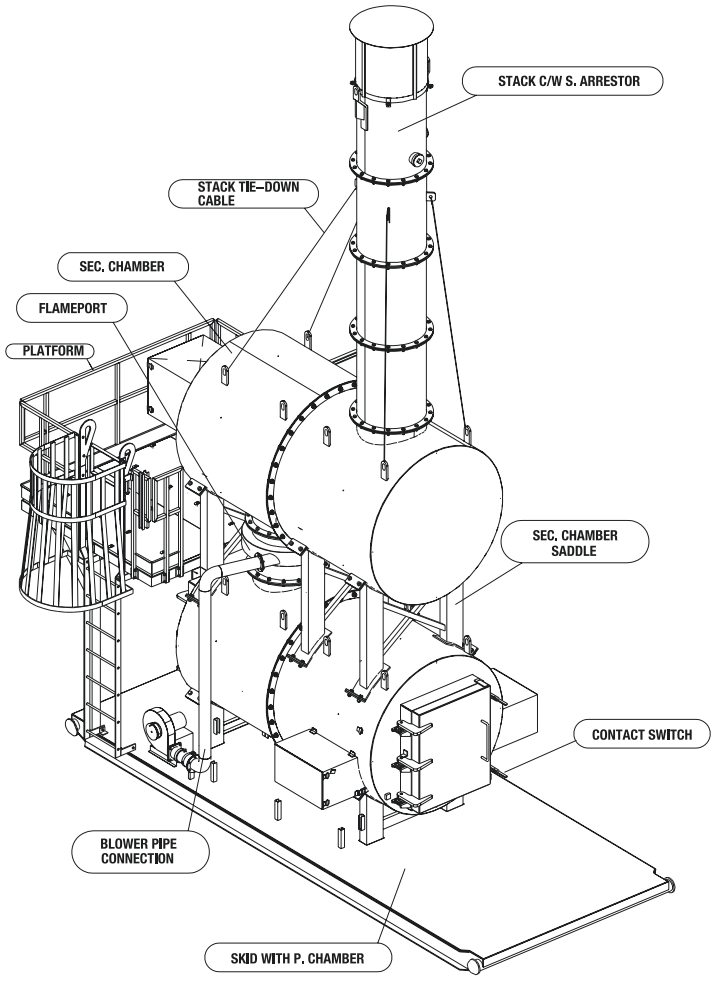


FIGURE 5 OVERALL VIEW SHOWING THE SECTIONS

5.3 Primary Chamber Section

TABLE 5 COMPONENTS IN THE PRIMARY CHAMBER SECTION {FIGURE 6 & FIGURE 7)

Code	Component	Description	Function
PC	Primary Chamber	Built in-house. Inside Vol: 2.74 m3 Refractory + Insulation	Pyrolysis and gasification Combustion of fixed carbon
PC_B	Auxiliary Burner	Becket2 x WIC-201; 770,000 BTU/h (Each); 5.5 USG/h (Each)	Start-up and maintains a minimum temperature
PC_T	Thermocouple	Stainless Steel	Used by PC Temp. Controller to regulate burner
PC_D	Charging Door & Ash Door	Built in-house. Feed Door: 90cm (Height) x 70 cm (Width) Ash Door: 86 cm (Height) x 70 cm (Width)	Load waste and ash removal
PC_S	Contact Switch	Square D ZCKJ1H7 (2)	Turn off PC burner when Feed door/Ash door is opened

5.4 Secondary Chamber Section

TABLE 6 COMPONENTS IN THE SECONDARY CHAMBER SECTION {FIGURE 6 & FIGURE 7)

Code	Component	Description	Function
SC	Secondary Chamber	Built in-house. Inside Vol: 2.87m3 Refractory Insulation	Complete combustion of gases and soot generated in Primary Chamber
SC_B	Auxiliary Burner	Becket WIC-301; 1,600,000 BTU/h; 13.0 USG/h	Start-up and maintain minimum set temperature
SC_T	Thermocouple	Ceramic	Measure temperature in Secondary Chamber
FP_P	Flame-port Plenum	Turbulent vortex flow built inhouse.	Mixing of combustible gases and flame-port air
FP_B	Flame-port Blower	4C 108 Dayton; 1 HP; 3600 rpm	Combustion air supply to flame-port plenum
FP_T	Flame-port Throttle	Butterfly valve	Controls flame-port airflow
ST	Stack	Refractory+ Insulation, built in-house.	Dispersal of flue gas

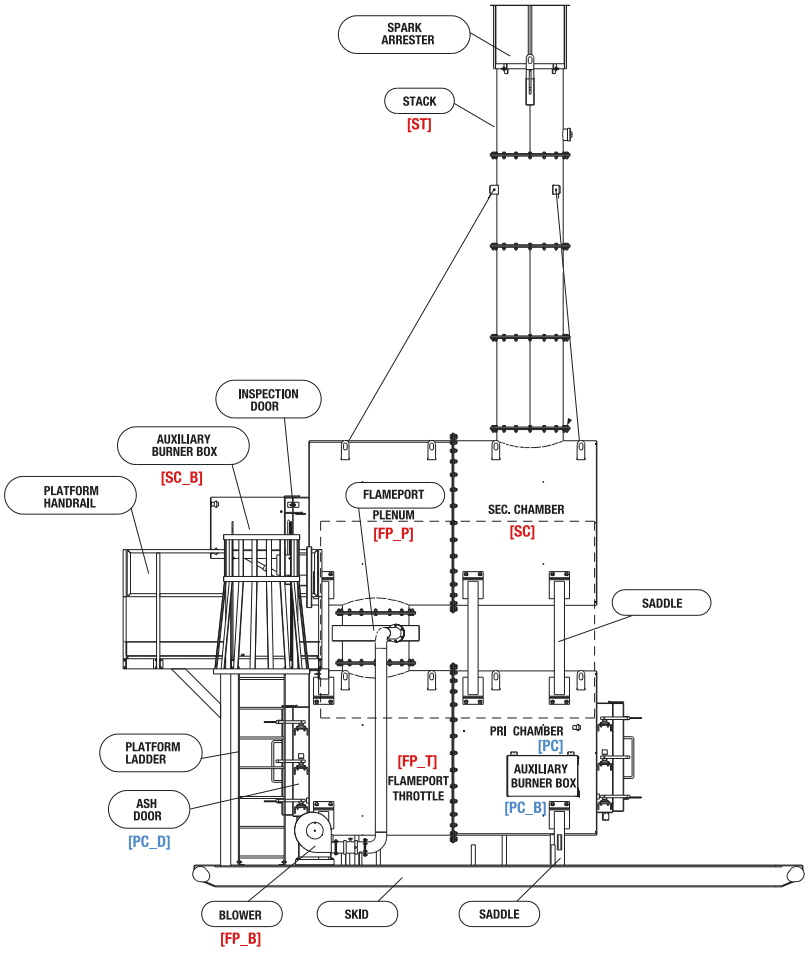


FIGURE 6 COMPONENTS IN THE PRIMARY AND SECONDARY CHAMBER SECTIONS (1)

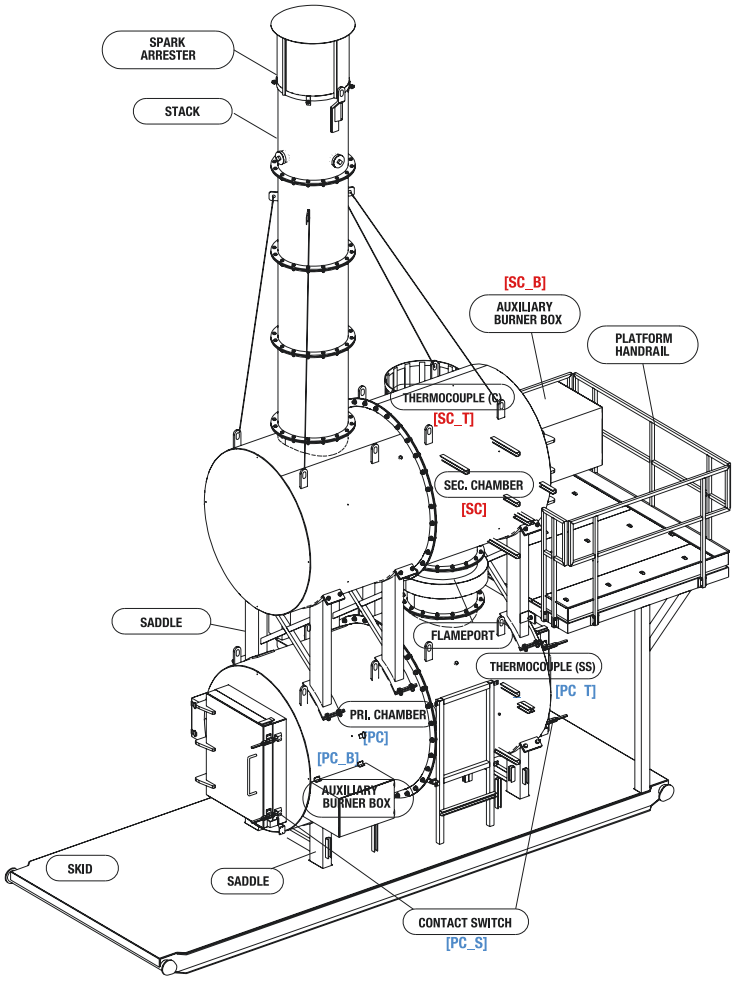


FIGURE 7 COMPONENTS IN THE PRIMARY AND SECONDARY CHAMBER SECTIONS (2)

5.5 Control Panel Section

The components are listed in Table 7.
Figure 8 Overview of Control Panel, Showing the Main Sections shows a photograph of the whole control panel, which has been divided into sub-sections marked A, B, C, and D.

TABLE 7 COMPONENTS IN THE CONTROL PANEL SECTION

Code	Label	Function
Sub-Section A: Indicator LEDs (ON-OFF)		
C3, C5 C8	Primary Blower Secondary Blower	GREEN PC_BL GREEN SC_BL
C6	Flameport Blower	GREEN FP_B
C2, C4 C7	Primary Burner Secondary Burner	RED PC_B RED SC_B
Sub-Section B: Burn Timer		
T1	Burn Timer	Set burn-cycle duration to the specified time. (Start switch restarts timer)
Sub-Section B and C: Main Controller and Controllers for Burners and Blowers		
PB1 PB2 R1	Start Switch Energy Stop Contact Switch	Initiate Pre-Purge, Burn, Burn-Down, Cool-Down Automatic Cycles. Emergency Use Only. For Normal Stop, Set Burn Time to 0. Safety Apparatus, Will Turn ON/OFF Primary Chamber Burner When Feed Door is OPEN/CLOSED.
Sub-Section D: Omron Temperature Controllers and Indicators		
TC1 TC2 TC3	Primary Chamber T.C. Secondary T.C. Secondary Trigger T.C.	Temperature Displays and Control of Minimum Temperatures in Primary and Secondary Chambers by Setting Adjustable Set Points (OMRON E5CN). Primary Burner Enabled When Secondary Trigger Reaches its Specific Temperature Set Point.
Sub-Section E: Touchscreen Digital Display		
	Primary Blower Secondary Blower Flameport Blower	Blower symbol - GREEN "OFF" Blower symbol - BLUE "ON"
	Primary Burner Secondary Burner	Burner Symbol - NO FLAME "OFF" Burner Symbol - FLAME SYMBOL "ON"
	Digital Magnetic Guage	Displays pressure of Primary Chamber Should be Negative Pressure between 0 and -0.5 inches
	Feed Door / Ash Door	Displays if door is open or closed.

Notes:
This panel has been configured with Burner Protection which ensures that if the primary and/or secondary chamber is hot, the corresponding burner-blower will run even if the cool-down period has elapsed, or if there has been a power disruption.

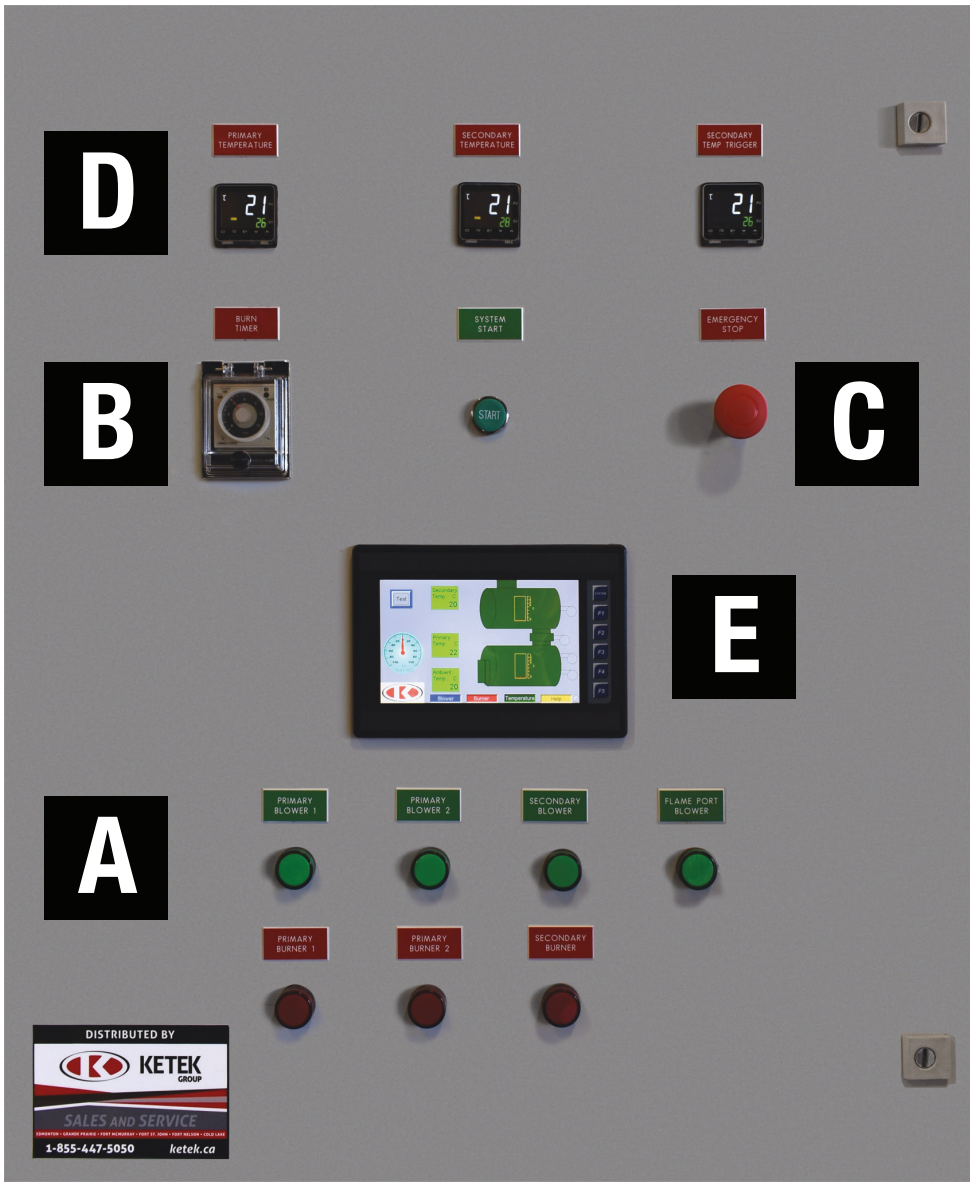


FIGURE 8 OVERVIEW OF CONTROL PANEL, SHOWING THE MAIN SECTIONS

The operation of the incinerator can be described by distinct sequential steps as shown in Figure 9. There are additional necessary steps which involve safety, routine inspection and waste batch preparation, which will be first described.

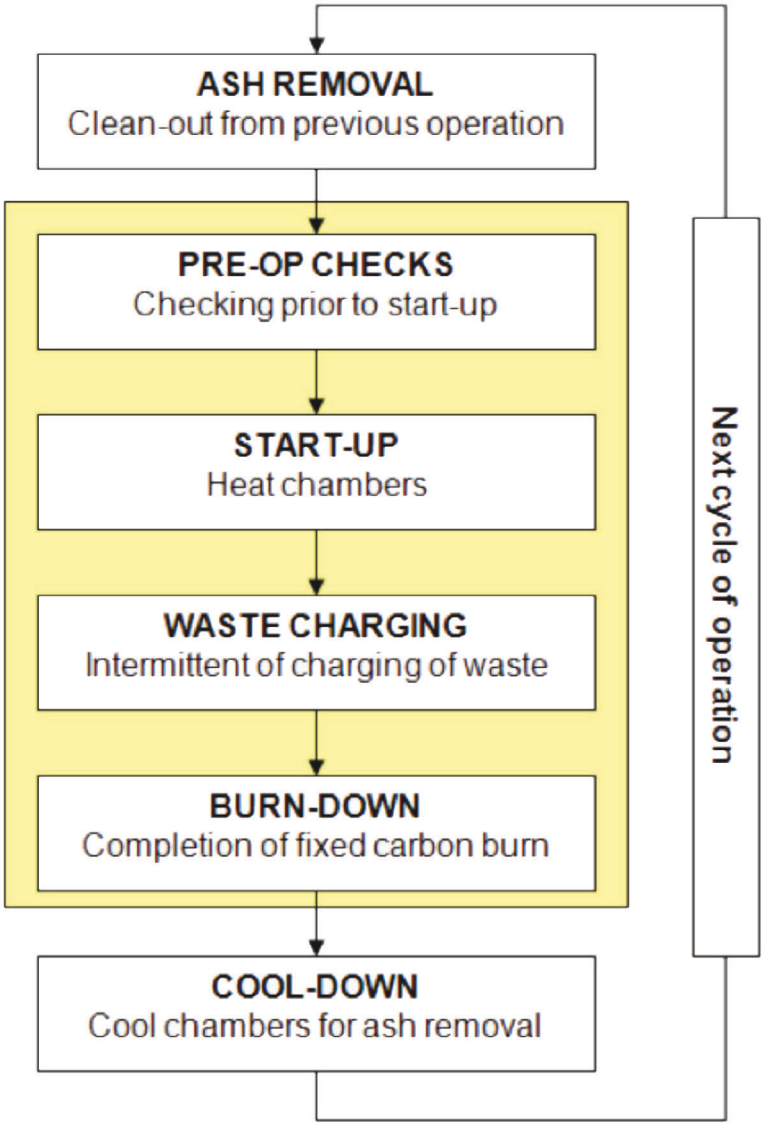


FIGURE 9 STEPS IN THE OPERATION OF THE INCINERATOR

6.1 Safety equipment

The following Personal Protective Equipment should be used while operating the incinerator system:

- Long-sleeved shirt and long pants;
- Long-cuffed, puncture resistant gloves;
- CSA approved, Grade 1 safety footwear;
- CSA/ANSI approved safety glasses.

The personal protective equipment related to specific tasks are listed below:

- Ash removal and handling: NIOSH N95 respirator
- Waste charging: (i) heat protective clothing and gloves, and (2) CSA/ANSI approved full face shield.

The hazards that could be encountered arise from the following (not in any order of importance):

- Contact with waste (infectious or toxic components, or sharps);
- Exposure to heat, from contact with hot surface or radiation from the primary combustion chamber when the waste charging door or ash removal door is opened.

Therefore, the general precautionary actions include: Not opening waste batches

- Not touching hot surfaces, and minimum exposure to heat radiation through open doors (charging / ash doors while combustion is taking place).
- Wearing appropriate PPE for charging waste and raking the primary chamber, AND minimizing the time for those tasks.

6.2 Routine inspection and maintenance

- Check fuel lines for leak and check connections Check spark arrestor to ensure no plugging
- During ash removal (see next section):
  - Inspect refractory for large cracks (not expansion cracks)
  - Inspect door gaskets for damages

6.3 Waste batch preparation

The following cautionary notes should be followed:

- NO explosives, aerosol cans or containers containing combustible liquids
- Make sure that every batch can go through the waste charging door easily, regardless of its weight.
  If others prepare the batches, the operator should tell them about the maximum batch size.
- DO NOT open batches and "rearrange" the contents for health/safety reasons.

6.4 Ash removal

Typically, ash from previous operation is left to cool, and ash removal is done prior to current operation.

- Make sure combustion chamber is sufficiently cool (DO NOT spray water into the combustion chamber) While removing ash, avoid damaging the burner tip Use non-combustible container
- Minimize dust generation
- Light water spraying on ash in the container is OK to minimize dust generation Ash to be removed daily (after sufficient cool down period)
- Dispose of ash as specified in the guidelines or regulations

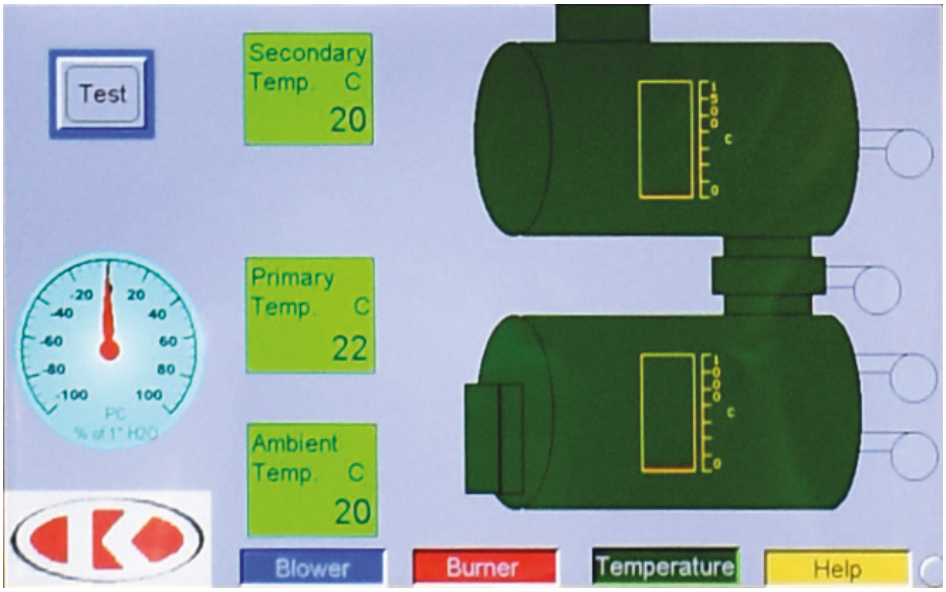
6.5 Pre-operational checks

- When diesel or propane is used, check fuel tank to make sure there is enough fuel (see Figure 14 for estimates of fuel consumption, depending on burner size and length of operation). Conduct inspection around incinerator, make sure there is no debris or fire hazards; area should be clean
- Open fuel valve
- Check fuel lines for leaks and check all connections
- Check for any physical damage on incinerator including stack and spark arrestor Inspect thermocouples, feed door/ash door seals, and blower inlets
- Re-check that the combustion chamber is empty Check power connection
- When diesel is used, bleed the diesel lines to the burners if necessary

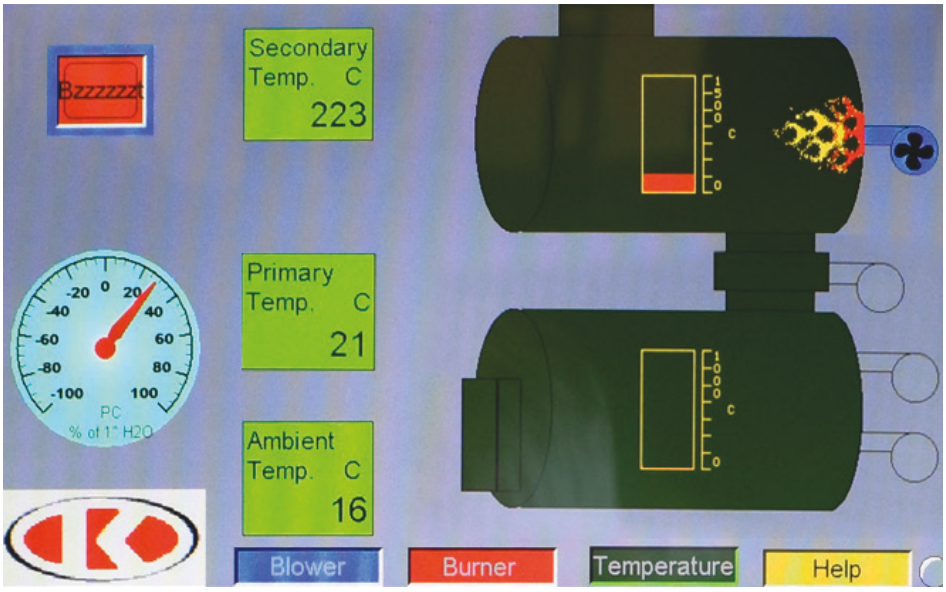
6.6 Operational Procedure

1. The first step in managing waste is to understand the quantity and composition of the waste that is generated. A waste audit should be completed. (Ketek Group can provide a waste audit, which can provide the following:
- Determine the quantity of waste from each type of operation
- Characterize the waste stream to determine what opportunities exist for:
- Reducing the quantity of waste generated,
- Reusing materials and recycling as much as possible before considering disposal.
2. Before operation of an incinerator, the area surrounding the incinerator shall be free of any debris and tripping hazards. Maintaining proper housekeeping for the incinerator is important and will reduce safety hazards such as slips, trips and falls.
3. A pre-operational checklist should be completed prior to operation of the incinerator. (Ketek can prepare a pre-operational checklist for you). Make sure all ash is removed from the previous burn. Record the weight of ash on checklist.
4. The operational checklist should be continually filled out with the required information throughout the day and during operation of the incinerator.
5. The incinerator should be loaded to the limited charging capacity (both in terms of waste quantity and the calorific value of waste charge). The incinerator should be charged with the appropriate mix and quantity of waste, the operator should close the door, ensure all interlocks are engaged, and start the burn cycle.

6. Turn the timer to 12 hours and press the green "Start" button.



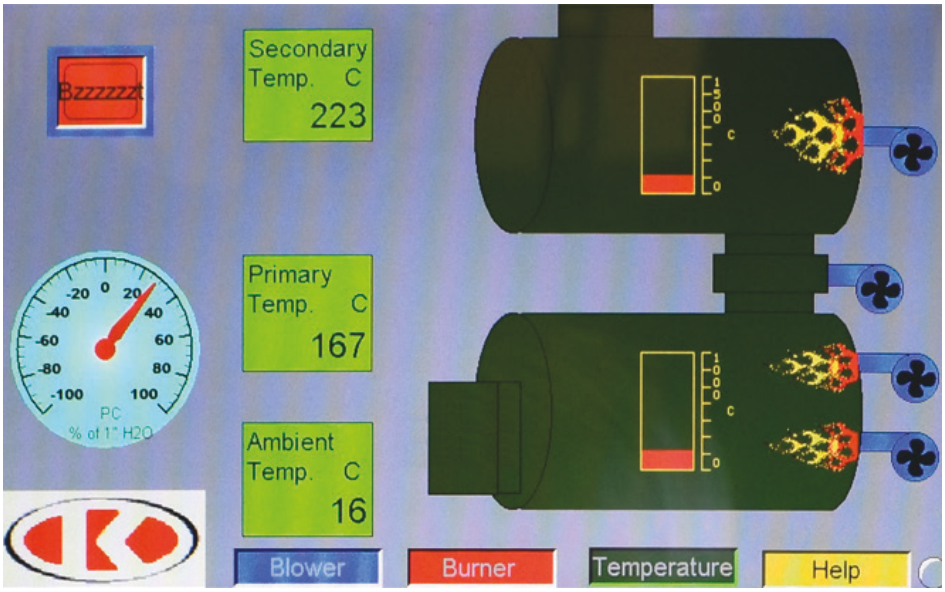
7. Proceed with inspecting of the incinerator and make certain that all burner blowers (two burners in Primary Chamber and one in Secondary Chamber) are functioning correctly.
8. After five minutes, primary burner motor will shut off and the secondary burner (flame) should be running. You will see the temperature increase on the temperature display "Secondary Chamber T.C."



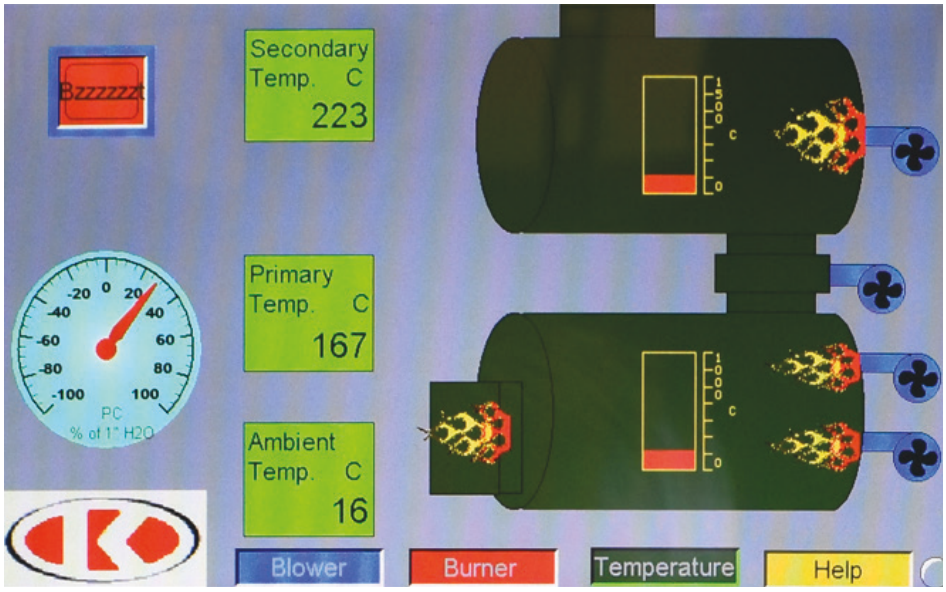
9. The secondary burner heats up to the specified temperature in "Secondary Temperature

Trigger."

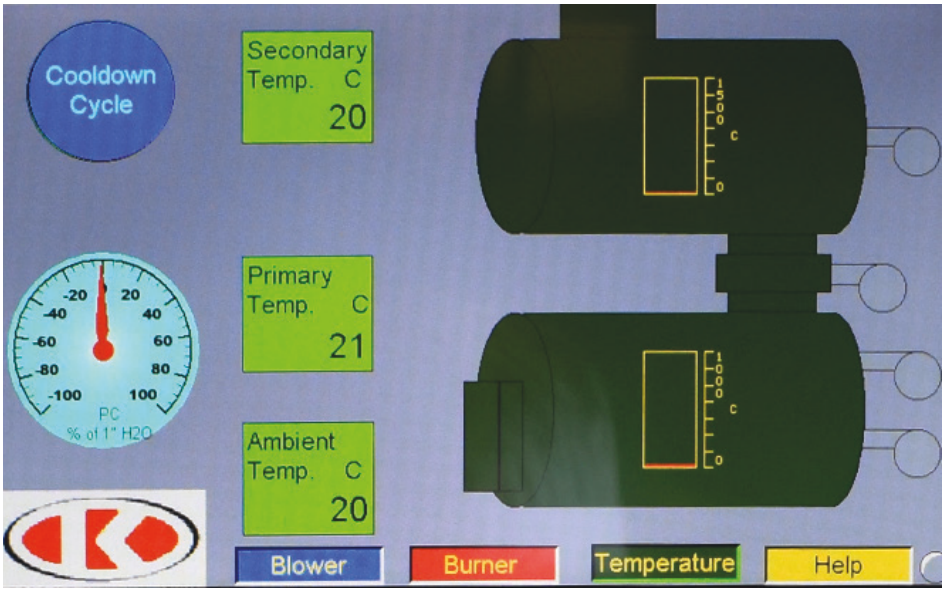
10. At this point, primary burners (flame and blowers) and flame port blower will come on and you will see the temperature increasing on the temperature display "Primary Chamber T.C."



11. The temperature will keep increasing until it goes up to the set point and after that burners will continually function on/off to maintain the specified temperature set on the incinerator control system.
12. After about 2-3 hours into the burning process, open the door and check the status of the waste and rake if necessary. Always rake from the ash door side.



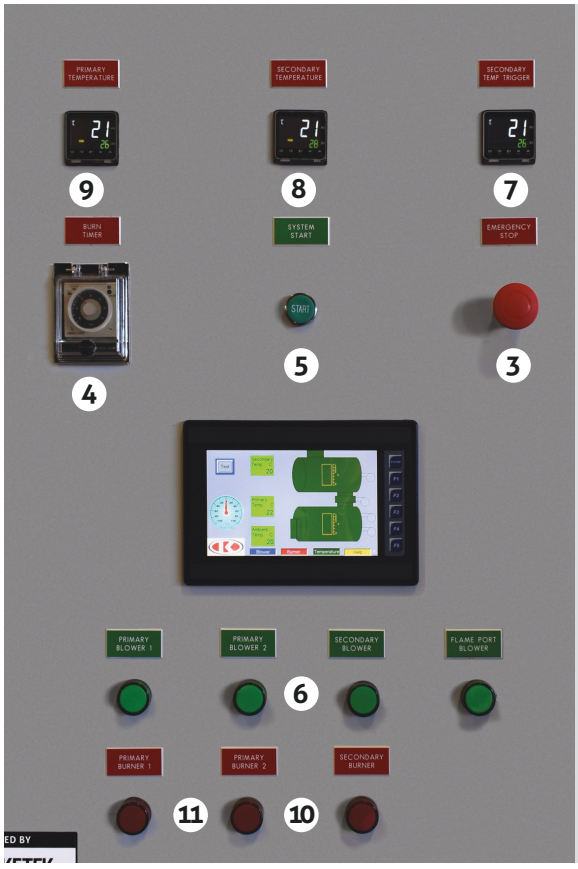
13. Approximately one hour after the rake, check the waste status again. If not burned, rake it and close the door. If waste seems burned and you do not need to burn another batch, then manually run the burn timer to zero. If you need to burn more batches, lower the set point on "Burn Timer" to 0 by pressing the "▲" down arrow. Give about 30-60 minutes for the Primary Chamber to cool down.
14. Load the next batch in the Primary Chamber and turn the timer to 12 hours.
15. Repeat steps 11 to 13 for other batches of the day.
16. For the final batch of the day turn the timer to about 5-6 hours. Rake in between if required.
17. After the timer runs out, the primary burners will no longer produce flames, but the blowers will continue to run. At this time the secondary chamber burner will still keep running for another half hour.



18. After secondary burners shut down, all the blowers will keep running for another 5-6 hours to give enough time for the incinerator to cool down and prevent any damage to the burners. If after the cool down process the temperature in the chambers is still above 250°C, the blowers will continue to run until the temperature drops below the 250°C value.
19. The pre-operational checklist should be given to the supervisor for documentation and any further procedures. Pre-Operational Checklist should be filed and kept for record.
20. The touchscreen digital display records the incineration operations. It comes standard with 32 Gb of memory. The PLC records operations such as blower operation, burner and door feed, and incinerator chamber temperature. To go back to the home screen please push the Ketek symbol, located bottom left of screen.

Note:

a. Do not operate the incinerator if something is not functioning properly. Immediately tell your supervisors.
b. Do not overload the incinerator
c. It is important that waste should neither be open-burned nor burned in a barrel
d. Wear all required PPE (gloves, face-shield, dust mask, flame retardant coveralls, etc.)
e. If flame detection control locks out, try resetting it by pressing red button on the burner control. If it keeps resetting, let your supervisor know immediately.
f. Always ask if unsure about something.



1. Perform Pre-Op Checks
2. Load first waste charge
3. Ensure Emergency Stop is pulled out
4. Set burner timer
5. Press "Start"
6. Observe blowers in pre-purge.
   Can be seen as Touchscreen display.
7. Set Trigger TC to 650°C
8. Set Secondary TC to - 1100°C
9. Set Primary TC to - 600°C
10. Observe secondary burner.
    Can be seen as Touchscreen display.
11. Once Trig Temp is reached, observe all blowers and Primary Chamber.
12. Automatic operation until burn timer expires. Burn Down and Cool-Down cycles follow automatically.

FIGURE 10 OPERATING SEQUENCE

Note: Temperatures in Steps 8 and 9 may be governed by regulations:
If so, SET TEMPERATURE TO THE REGULATORY VALUES

6.7 Waste charging:

For Batch feeding (recommended) see Figure 11.

1. After de-ashing the cooled-down incinerator, load waste on the hearth. Refer to training notes and operating experience.
2. Ensure Burn Timer is set to 4-5 hours, depending on load size. Pressing "Start" button begins a new cycle.
3. Primary burners will start once Secondary Chamber is at trigger temperature (TC3 set-point typically at 650°G)
4. After three hours, open door, check state of ash, rake if needed.

FIGURE 11. PROCEDURE FOR BATCH WASTE CHARGING

Additional Notes to Figure 11:
** The main danger is from exposure to heat radiation, and from waste catching fire before it is inside the Primary Chamber. Precautionary steps include:
(a) Wear proper PPE,
(b) Make sure waste batch can go through the charge door easily,
(c) Open door, charge waste and close door as quickly as possible.
*** The time for complete combustion varies, depending on batch size, weight and composition. Check burning conditions from charge door. Rake if necessary.

6.8 Waste Incineration Records

To demonstrate appropriate operation and maintenance of the incinerator, we recommend that the facility maintain records containing at least the following information (or as per permits/regulations):

- A list of all staff who have been trained to operate the incinerator; type of training conducted and by whom; dates of training; dates of refresher courses.
- All preventative maintenance activities undertaken on the equipment.
- Records of operation of the incinerator.
- Records of quantities of waste incinerated.
- Summarized annual auxiliary fuel usage.
- A list of all shipments/disposal of incinerator residues, including the weight transported and disposed of by type if necessary, and the location of the disposal site.
- Results of any stack emission monitoring and ash sampling information.

All raw data records from the operation of the incinerator will be retained for inspection by the appropriate authorities for a period of three years (or any other time period as deemed necessary).

6.9 Burn-Down and Cool-Down: see Figure 12

For Batch feeding (recommended) see Figure 11.

1. Automatic Burn-Down cycle begins after burner timer expires. Primary burners shut down immediately.
2. Automatic Cool-Down cycle follows. Secondary burner shuts down.
3. Blowers automatically shut down once chambers have cooled to 250°C. Cycle is complete.

FIGURE 12. PROCEDURE FOR BURN DOWN.

6.10 Maintenance and Inspection

In addition to the routine inspection and maintenance previously mentioned, only the burner(s) and the blower(s) require maintenance, which is quite minimal; see manuals in the binder. The following inspection steps are recommended:

TABLE 8 RECOMMENDED INSPECTIONS

How Often	Component	Inspection and checking
Daily	Thermocouples PC_T and SC_T	Check that the readings of temperature controllers are close to the estimated temperatures of the Primary and Secondary Chambers
	Contact switches PC S	Free movement, no obstruction
	Gasket/seal waste feed door PC_D	Wear and tear; proper sealing
	Refractory in primary chamber PC	No large (not expansion) cracks; pieces falling out. Repair if necessary.
Weekly	Blowers PC_B, SC_B, FP_B	Inspect clean in-takes, clean if necessary
Monthly	External surfaces of PC and secondary chamber SC	"Spotty" discoloration may indicate damage to refractory and/or insulation
Annual	Refractory in SC	No large (not expansion) cracks; repair if necessary

6.1.1 Trouble Shooting

Table 9 shows a list of operational problems that may be encountered, the possible causes and corrective measures. No list can cover all potential problems. Please report problems or unusual observations, even if you have corrected them yourself.

TABLE 9 TROUBLESHOOTING GUIDELINES

Phase	Observation	Points/Items to look at.
Start UP	Incinerator won't start	□ Make sure there is power. □ Check emergency stop is not engaged. □ Timer is set to an actual value and mode. □ Make sure there is power on all phases/legs coming into the incinerator.
Pre-Purge Phase	Skipping or not starting the Pre-purge.	□ Check that pre-purge timer works correctly. □ Check emergency stop is not engaged. □ Make sure there is power on all phases/legs coming into the incinerator.
	Auxilia burner blower(s) won't run in pre-purge cycle.	□ Check Breakers. □ Check burner blower contacts are energized. □ Check that overload switch on the motor is not tripped. □ Check there is power at the burner on the wire supplying power to the motor (Use Multi meter) □ Check for a seized motor by manually spinning the blower wheel. (Make sure power is off and locked out)
Pre-heat Phase	Secondary burner wont ignite	□ Check Breakers. □ Check there is power at the Genisys Control. □ Check that Genisys control is not locked out.
	Burner keeps Locking out after manual reset.	□ Check all fuel valves are on. □ Check Burner contacts are energized. □ Check there is sufficient fuel in the tank. □ Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present. If diesel is gelled (due to cold weather) it will not let the burner operate efficiently. □ If there is no fuel coming out of the pump and the motor is running then it could be a damaged coupling or seized pump. □ If bubbles do not disappear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight. □ Check that CAD cell is clean. □ Try and hear the spark at the electrodes.
Burn Phase	Primary burner(s) won't ignite.	□ Check Door Switch(s) are engaged. □ Check Fuses. □ Check there is power at the Genisys Control. □ Check that Genisys control is not locked out.

	Burner keeps Locking out after manual reset.	□ Check all fuel valves are on. □ Check Burner contacts are energized. □ Check there is sufficient fuel in the tank. □ Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present. If diesel is gelled it will not let the burner operate efficiently. □ If there is no feel coming out of the pump and the motor is running then it could be damaged coupling or seized pump. □ If bubbles do not dissapear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight. □ Check that CAD cell is clean. □ Try and hear the spark at the electrodes.
	Flame port Blower won't start	□ Check Breakers. □ Check blower contacts are energized. □ Check there is power at the electrical box on the wire supplying power to the motor (Use Multimeter) □ Check for a seized motor by manually spinning the blower wheel. (Make sure power is off and locked out)
General	Auxiliary burner(s) ignite for a while and then stop while system is still calling for them to be on.	□ Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present. □ If bubbles do not disappear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight.
	Omron Temperature controller showing "S.err"	□ Make sure wire connections are tight at the thermocouple and on the controller inside the panel. □ Check thermocouple is not damaged. To do this follow steps below: □ If you connect red and yellow wire together at the thermocouple and the error goes away, then go ahead change the thermocouple. □ If error does not go away after connecting the wires together then most probably the wire is damaged or a small chance of a faulty controller.
	Liquid dripping from the door.	□ Check that the door seals are not damaged. □ Check there are no depesits on the door or the door frame. Scrape off any deposits. It is a good practice to do it once a week.

For further troubleshooting of burners or blowers please refer to equipment specific manuals (attached at the end of this manual).

Before conducting any work, make sure all power is locked/tagged out and that any site specific safety procedures are followed before any maintenance occurs.

6.12 Auxiliary Fuel Consumption Rate

Figure 13 shows the volumetric flow rates of propane and diesel as a function of burner rating. If the TOTAL burner rating is X million Btu/h, and the operating time from start-up to the end of burn-down is t hours, the maximum fuel needed is:

V = Y * t USG where Y is the fuel consumption rate for X million Btu/h rating, as shown in the graph.

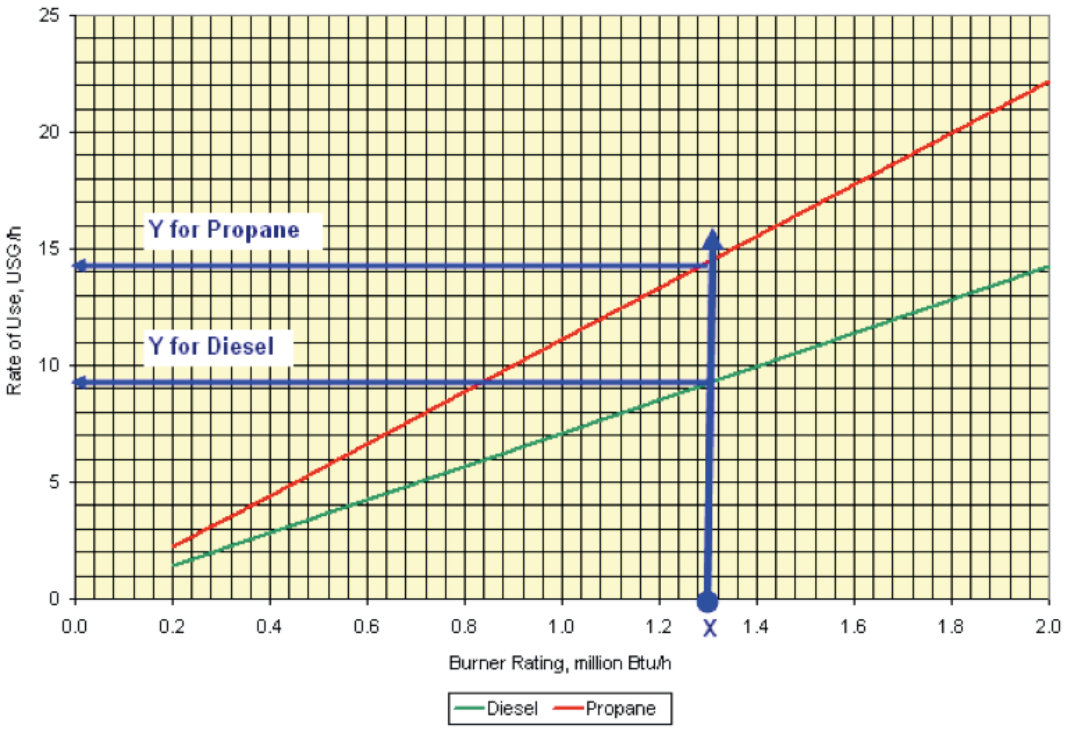


FIGURE 13 CONSUMPTION RATES OF PROPANE AND DIESEL

APPENDIX A

1. SUGGESTED SPARE PARTS LIST
2. BURNER WIC 201
3. BURNER WIC 301
4. BLOWER DAYTON 4C 108
5. INSPECTION CHECKLIST
6. WIRING DIAGRAM

7.1 Suggested Spare Parts List

CY-100-CA-D RECOMMENDED SPARE PARTS LIST

Description	Qty	KETEK Part No.
Gun Burner Beckett, WIC 201 16" (5.5GPH)	2	129230
Gun Burner Beckett, WIC 301 10-1/4" (7.0GPH)	1	129240
Dayton 4C-108 Flameport Blower	1	129305
Air Tube Combination for WIC 201 6 5/8	2	129420
Air Tube Combination for WIC 301 10-1/4"	1	129455
Motor for WIC 201	2	129480
Motor for WIC 301	1	129520
Coupling, Flex for WIC 201	4	129400
Coupling, Flex for WIC 301	2	129510
Fuel Pump A2YA-7916 Suntec	2	129320
Fuel Pump B2TA-8851 Suntec	1	129321
Blower Wheel for WIC 201	2	129410
Blower Wheel for WIC 301	1	129411
Transformer, Ignition "S" for WIC 201	2	129360
Transformer, Ignition "S" for WIC 301	1	129530
Nozzle (5.5 GPH 60° B)	2	144700
Cad Detector Call (If Applicable)	4	120730
Beckett Genysis Control (If Applicable)	2	177800
Timer, H3CR-A 11pin	1	152760
Omron Temperature Controller	1	131850
Panel Fuse Package	8	No item #
Thermocouple Ceramic (Secondary Chamber) – 12.75"	2	130140
Thermocouple Ceramic (Primary Chamber) – 12.75"	2	163670
Proximity Switch Door	1	132600
Limit Switch Assembly	1	130090
Gasket, Ceramic Fibre ¼" x 2" (price per foot)	100 ft.	132610
Gasket Cement, HT Silicone Tube	4	132620
Spark Arrester, Stainless Steel (Crating Not Included in Price)	1	130341
Filter Adapter (For Fuel Tank)	1	147840
Filter, Fuel LFF2 (For Fuel Tank)	2	133460

SF/SM

Oil Burner Manual

Beckett

RESIDENTIAL BURNERS

c UL US

⚠ WARNING **Potential for Fire, Smoke and Asphyxiation Hazards**

Incorrect installation, adjustment, or misuse of this burner could result in death, severe personal injury, or substantial property damage.

To the Homeowner or Equipment Owner:

- Please read and carefully follow all instructions provided in this manual regarding your responsibilities in caring for your heating equipment.
- Contact a professional, qualified service agency for installation, start-up or service work.
- Save this manual for future reference.

To the Professional, Qualified Installer or Service Agency:

- Please read and carefully follow all instructions provided in this manual before installing, starting, or servicing this burner or heating system.
- The Installation must be made in accordance with all state and local codes having jurisdiction.

To the Owner:

Thank you for purchasing a Beckett burner for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your oil burner.

Your Beckett burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

We recommend annual inspection/ service of your oil heating system by a qualified service agency.

Daily – Check the room in which your burner/appliance is installed. Make sure:

- Air ventilation openings are clean and unobstructed
- Nothing is blocking burner inlet air openings
- No combustible materials are stored near the heating appliance
- There are no signs of oil or water leaking around the burner or appliance

Weekly

- Check your oil tank level. Always keep your oil tank full, especially during the summer, in order to prevent condensation of moisture on the inside surface of the tank.

Contents

Limited Warranty Information

The R. W. BECKETT CORPORATION ("Beckett") warrants to persons who purchase its "Products" from Beckett for resale, or for incorporation into a product for resale ("Customers"), that its equipment is free from defects in material and workmanship. To qualify for warranty benefits, products must be installed by a qualified service agency in full compliance with all codes and authorities having jurisdiction, and used within the tolerances of Beckett's defined product specifications.

To review the complete warranty policy and duration of coverage for a specific product, or obtain a written copy of warranty form 61545, please choose one of the following options:

Visit our website at: www.beckettcorp.com/warranty
Email your request to: rwb-customer-service@beckettcorp.com
Write to: R. W. Beckett Corporation, P. O. Box 1289, Elyria, OH 44036

NOTE: Beckett is not responsible for any labor cost for removal and replacement of equipment.

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes, nor authorizes any person to assume for Beckett, any other liability or obligation in connection with the sale of this equipment. Beckett's liability and Customer's exclusive remedy is limited to the cost of the product.

Beckett
CORPORATION

USA: P.O. Box 1289 • Elyria, Ohio 44036
Canada: R.W. Beckett Canada, Ltd. • Unit #3, 430 Laird Road • Guelph, Ontario N1G 3X7
www.beckettcorp.com

Part Number 6104 BSF/SM R07, Printed in the U.S.A. 06/15

General Information

Hazard Definitions:

DANGER	Indicates a hazardous situation that, if not avoided, *will* result in **death or serious injury**.
WARNING	Indicates a hazardous situation that, if not avoided, *could* result in **death or serious injury**.
CAUTION	Indicates a hazardous situation that, if not avoided, *could* result in **minor or moderate injury**.
NOTICE	Used to address practices not related to physical injury.
SAFETY INSTRUCTIONS	Safety instructions signs indicate specific safety-related instructions or procedures.

WARNING Owner's Responsibility

Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

Contact a professional, qualified service agency for the installation, adjustment and service of your oil heating system. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

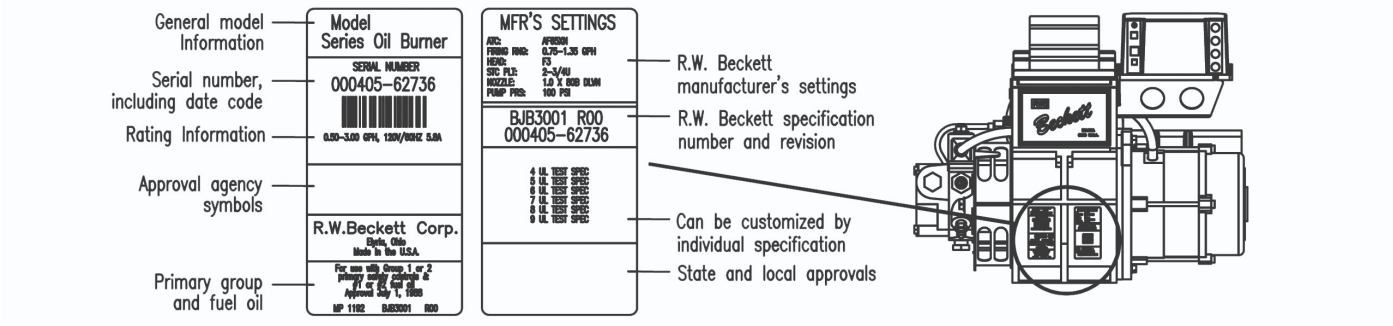
Please carefully read and comply with the following instructions:

- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner/appliance by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

NOTICE This manual contains information that applies to both SM and SF burners. These burners may appear to be basically identical, but there are differences in design and performance. Please review the comparison chart below:

Feature	SM	SF
Firing Rate Range	1.25 to 3.00 gph	1.25 to 5.50 gph
Motor	1/5 HP	1/4 HP
Fuel Pump Capacity	3 gph (standard)	7 gph (standard)
UL Air Tube Combinations	See ***Table 2***	See ***Table 2***
Blocking Oil Solenoid Valve	Optional	Required above 3 gph
Primary Control Lockout Timing	15 to 45 seconds (optional)	15 seconds maximum
Primary Control	Beckett GeniSys 7575P	Beckett GeniSys 7505 or 7575
Option to ship less Primary Control for Pressure Washer Industry	Yes (Model 7575P Primary Control with "valve-on delay" and "motor-off delay" required in final installation.)	No

Figure 1 – Burner Label Location



⚠ CAUTION

Frozen Plumbing and Water Damage Hazard

If the residence is unattended in severely cold weather, burner primary control safety lockout, heating system component failures, power outages or other electrical system failures could result in frozen plumbing and water damage in a matter of hours. For protection, take preventive actions such as having a security system installed that operates during power outages, senses low temperature and initiates an effective action. Consult with your heating contractor or a home security agency.

Table 1 – Burner Specifications

Model SM Capacity (Note1)	Firing rate range: 01.25 – 3.00 GPH Input: 175,000 – 420,000 Btu/hr
Model SF Capacity (Note1)	Firing rate range: 1.25 - 5.50 GPH Input: 175,000 – 770,000 Btu/hr
Certifications/ Approvals	Model SM - UL listed to comply with ANSI/ UL296 and CSA-B140.0. Model SF - UL listed to comply with ANSI/UL 296 and CSA-B140.0.
Fuels	**⚠ CAUTION** **DO NOT USE GASOLINE, CRANKCASE OIL, OR ANY OIL CONTAINING GASOLINE.** **U.S.** #1 or #2 fuel oil only (ASTM D396) **Canada** #1 stove oil or #2 furnace oil only
Electrical	*Power supply:* 120 volts AC, 60 Hz, single phase *Operating load (SM):* 5.8 Amps max *Operating load (SF):* 7.1 Amps max *Motor (SM):* 1/5 hp, 3450 rpm, NEMA 'N' flange, manual reset over load protection *Motor (SF):* 1/4 hp, 3450 rpm, NEMA 'N' flange, manual reset over load protection *Ignition:* Continuous duty solid-state igniter
Fuel pump	Outlet pressure: Note 2
Air tube	ATC code: See ***Table 2***
Dimensions (Standard)	*Height:* 12.5 in. *Width:* 15 in. *Depth:* 8.50 in. *Air tube diameter:* 4.00 in.
Air tube	ATC code: See ***Table 2***

Note 1: *Approval agency listed rating for Model SM is 1.25 to 3.00 gph and Model SF is 1.25 to 5.50 gph. However, the firing rate range is limited by the specific air tube combination being used. Refer to Table 2.*

Note 2. *UL Recognized to 4.0 GPH with a CleanCut pump for use in pressure washers.*

Note 3. *See appliance manufacturer's burner specifications for recommended pump discharge pressure.*

NOTICE

Special Requirements

- THE INSTALLATION OF A BURNER SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- For recommended installation practices in the U.S. refer to the latest edition of NFPA 31. (CSA-B139 and CSA-B140 in Canada.
- Concealed damage — If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim.
- When contacting Beckett for service information — Please record the burner serial number (and have available when calling or writing). You will find the serial number on the silver label located on the left rear of the burner. Refer to ***Figure 1***.

⚠ WARNING

Professional Service Required

Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

Please read and understand the manual supplied with this equipment. This equipment must be installed, adjusted and put into operation only by a qualified individual or service agency that is:

- Licensed or certified to install and provide technical service to oil heating systems.
- Experienced with all applicable codes, standards and ordinances.
- Responsible for the correct installation and commission of this equipment.
- Skilled in the adjustment of oil burners using combustion test instruments.

The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard for the installation of Oil-burning Equipment, NFPA 31 (or CSA-B139 and CSA-B140 in Canada). Regulation by these authorities take precedence over the general instructions provided in this installation manual.

Table 2 – Air Tube Combination (ATC) codes

Firing Rate (gph) (min-max)	Head	Static plate size (in.)	ATC Codes for usable air tube lengths ('A' in inches; See Figure 3.) 6-5/8	9	13	16
SF Burner Only						
1.25-2.25	F12	2-3/4	SF65VW	SF90VW	SF130VW	SF160VW
1.75-2.75	F22	2-3/4	SF65VP	SF90VP	SF130VP	SF160VP
1.75-3.25	F220	None	SF65FD	SF90FD	SF130FD	SF160FD
2.5-5.5	F310	None	SF65FU	SF90FU	SF130FU	SF160FU
SM Burner Only						
1.25-2.00	F12	2-3/4	SM65VW	SM90VW	SM130VW	SM160VW
2.00-3.00	F220	None	SM65FF	SM90FF	SM130FF	SM160FF
2.00-3.00	F22	None	SM65VM	SM90VM	SM130VM	SM160VM

Table 3 – Chamber Dimensions

Chamber Dimensions (inches)					
Firing Rate (GPH)	Round I.D.	Rectangular		Height	Floor to nozzle
		Width	Length		
1.25	11	10	11	12	5-6
1.50	12	11	12	13	6-7
2.00	14	12	15	13	6-7
2.50	16	13	17	14	7-8
3.00	18	14	18	15	7-8
3.50	19	15	19	15	7-8
4.00	20	16	21	16	8-9
5.00	23	18	23	18	9-10
5.50	24	19	24	19	10-11

Inspect/Prepare Installation Site

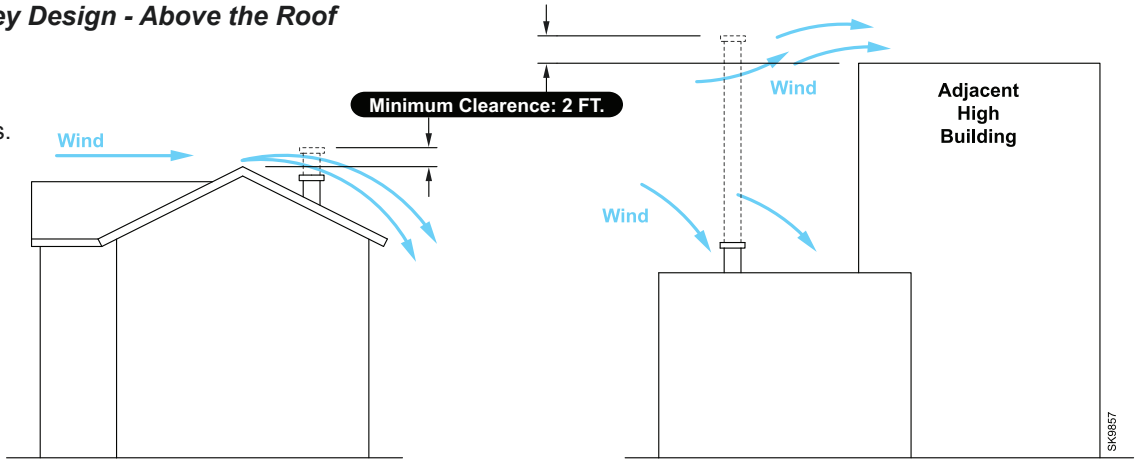
⚠ WARNING

Fire, Smoke & Asphyxiation Hazard

- Carefully inspect the chimney or exhaust vent system.
- Make sure it is properly sized and in good working condition.
- Follow the instructions supplied by the appliance manufacturer.
- The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard NFPA 31 for the installation of chimneys and vent sizing, (or CSA-B139 and CSA-B140 in Canada).
- Regulation by these authorities take precedence over the general instructions provided in this installation manual.

Figure 2 – Chimney Design - Above the Roof

NOTE: Correct chimney design is shown by dotted lines. Incorrect chimney design, as shown by the solid lines, may result in down-drafts.



Inspect Chimney or Direct Vent System

1. Starting with minimum gph firing rate, the minimum size recommended is 6” flue pipe with 8” X 8” inside chimney, unless specified otherwise by the appliance manufacturer.
2. A chimney flue shall extend at least 3 feet above the highest point at which the chimney comes in contact with the roof, and not less than 2 feet above the highest roof surface or structure within 10 feet horizontally of the chimney. Refer to ***Figure 2***.
3. Any accumulation of soot or debris in chimney offsets should be removed.
4. Any obstructions such as a protruding joint or a piece of broken tile wedged in the chimney should be removed.
5. No other appliance connection should be made to the same flue pipe.
6. The flue pipe should have an upward pitch toward the chimney of at least 1/4” per foot of length. It should fit tightly and should not project into the chimney.
7. Any leakage between tiles, around clean-out doors, or around the vent pipe should be sealed.

Insulated Stainless Steel Chimney Liners

The new designs of high efficiency oil furnaces and boilers in conjunction with flame retention oil burners are more efficient. One result of increased efficiency is lower flue gas temperatures. As flue gases rise in the chimney, they will cool and condense when they reach the dew point. The condensation will mix with the sulphur in the flue gases creating sulphuric acid. The acid will attack the chimney mortar, brick and clay liners causing corrosion, deterioration and blockage of the chimney. Eventually the blockage could prevent exhausting the flue gases. Instead, the flue gases could vent out the barometric damper into the living space.

Therefore, it is strongly recommended that an approved insulated stainless steel liner be installed.

- For those installations not requiring a chimney, such as through-the-wall vented appliances, follow the instructions given by the appliance and power venter (if used) manufacturers.

Combustion Air Supply

See NFPA 31 Standard for complete details.

⚠ WARNING

Adequate Combustion and Ventilation Air Supply Required

Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment, asphyxiation, explosion or fire hazards.

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest editions of the NFPA 31 and CSA-B139 regarding providing adequate air for combustion and ventilation.

Appliance located in confined space

The confined space should have two (2) permanent openings: one near the top of the enclosure and one near the bottom of the enclosure. Each opening shall have a free area of not less than (1) one square inch per 1,000 BTU’s per hour of the total input rating of all appliances within the enclosure. The openings shall have free access to the building interior, which should have adequate infiltration from the outside.

Exhaust Fans and Other Air-Using Devices

Size air openings large enough to allow for all air-using devices in addition to the minimum area required for combustion air. If there is any possibility of the equipment room developing negative pressure (because of exhaust fans or clothes dryers, for example), either pipe combustion air directly to the burner or provide a sealed enclosure for the burner and supply it with its own combustion air supply.

Clearances to Burner and Appliance

- Provide space around burner and appliance for easy service and maintenance.
- Check minimum clearances against those shown by the appliance manufacturer and by applicable building codes.

Combustion Chamber — Burner Retrofitting

Verify that the appliance combustion chamber provides at least the minimum dimensions given in ***Table 3***.

⚠ WARNING

Protect Steel Combustion Chamber From Burnout

Failure to comply could result in damage to the heating equipment and result in fire or asphyxiation hazards.

- When retrofitting appliances that have unlined stainless steel combustion chambers, protect the chamber by lining the inside surfaces with a ceramic fiber blanket, such as a wet-pac or other suitable refractory material.
- Some steel chambers may not require liners because the appliance was designed and tested for use with flame retention burners. Refer to the manufacturer's instructions.

Prepare the Burner

Burner Fuel Unit

Verify that the burner fuel unit is compatible with the oil supply system. For more details, refer to the pump manufacturer's instructions provided with the burner.

Attach Air Tube (if not already installed)

If using a flange and gasket, slide them onto the air tube. Then attach the air tube to the burner chassis using the four sheet metal screws provided. Refer to ***Figure 4*** for details.

Install Burner Nozzle (if not already installed)

⚠ WARNING

Correct Nozzle and Flow Rate Required

Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, sooting, puff-back of hot gases, smoke and potential fire or asphyxiation hazards.

Use only nozzles having the brand, flow rate (gph), spray angle and pattern specified by the appliance manufacturer.

Follow the appliance manufacturer's specifications for the required pump outlet pressure for the nozzle, since this affects the flow rate.

- Nozzle manufacturers calibrate nozzle flow rates at 100 psig.
- When pump pressures are higher than 100 psig, the actual nozzle flow rate will be greater than the gph stamped on the nozzle body. (Example: A 1.00 gph nozzle at 140 psig = 1.18 gph)

Securely tighten the nozzle (torque to 90 inch pounds). For typical nozzle flow rates at various pressures refer to ***Table 4***.

1. Remove the plastic plug protecting the nozzle adapter threads
2. Place a ¾" open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and finger tighten. Finish tightening with a ⅝" open-end wrench. Use care to avoid bending the electrodes.
3. If the nozzle is already installed, remove the nozzle line assembly to verify that the nozzle size and spray pattern are correct for the application (per appliance manufacturer's information). Verify that the electrode tip settings comply with ***Figure 3***.
4. If the nozzle is not installed, obtain a nozzle having the capacity and spray angle specified in the appliance manufacturer's information. For conversions or upgrades, when information is not available for the application:
   - Refer to ***Table 5*** to select the mid-range nozzle spray angle for the head type being used.
   - Fire the burner and make sure the combustion is acceptable and the flame is not impinging on chamber surfaces.
   - If a shorter flame is needed, select a wider spray angle. If a longer flame is needed, select a narrower spray angle.
   - Either hollow or solid spray patterns may be used. If combustion results are not satisfactory with the selected spray pattern, try the other pattern.

Table 4 – Nozzle Flow Rate by Size

Nozzle flow rate U. S. gallons per hour of No. 2 fuel oil when pump pressure (psig) is:					
Nozzle size (rated at 100 psig)	**125 psi**	**140 psi**	**150 psi**	**175 psi**	**200 psi**
1.25	1.39	1.48	1.53	1.65	1.77
1.35	1.51	1.60	1.65	1.79	1.91
1.50	1.68	1.77	1.84	1.98	2.12
1.65	1.84	1.95	2.02	2.18	2.33
1.75	1.96	2.07	2.14	2.32	2.48
2.00	2.24	2.37	2.45	2.65	2.83
2.25	2.52	2.66	2.76	2.98	3.18
2.50	2.80	2.96	3.06	3.31	3.54
2.75	3.07	3.25	3.37	3.64	3.90
3.00	3.35	3.55	3.67	3.97	4.24
3.25	3.63	3.85	3.98	4.30	4.60
3.50	3.91	4.14	4.29	4.63	4.95
3.75	4.19	4.44	4.59	4.96	5.30
4.00	4.47	4.73	4.90	5.29	-
4.50	5.04	5.32	5.51	-	-
5.00	5.59	-	-	-	-
5.50	-	-	-	-	-

Table 5 – Nozzle Spray Angles

Recommended nozzle spray angles	
"F" head	70°, 80° or 90° nozzle

Note: Always follow the appliance manufacturer's nozzle specification, when available.

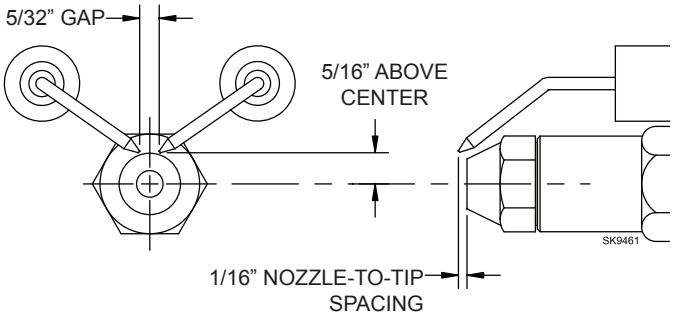
Check/Adjust Electrodes

Check the electrode tip settings. Adjust if necessary to comply with the dimensions shown in ***Figure 3***. To adjust, loosen the electrode clamp screw and slide/rotate electrodes as necessary. Securely tighten the clamp screw when finished.

Servicing Nozzle Line Assembly

1. Turn off power to burner before proceeding.
2. Disconnect oil connector tube from nozzle line.
3. Loosen the two screws securing igniter retaining clips and rotate both clips to release igniter baseplate. Then tilt igniter back on its hinge.
4. Remove splined nut.
5. "F" head air tube. - Remove nozzle line assembly from burner, being careful not to damage the electrodes or insulators while handling. To ease removal of long assemblies (over 9 inches), rotate assembly 180° from installed position after pulling partially out of tube.
6. To replace the nozzle assembly, reverse the above steps.

Figure 3 – Electrode Tip Adjustment



Check/Adjust 'Z' Dimension - 'F' Heads

See ***Figure 4*** for complete details.

Mount Burner on Appliance

Mounting Options

WARNING

Do Not use Adjustable Mounting Flange on Mobile Units

The shock and vibration could cause loss of burner alignment and insertion problems resulting in flame impingement, heavy smoke, fire and equipment damage.

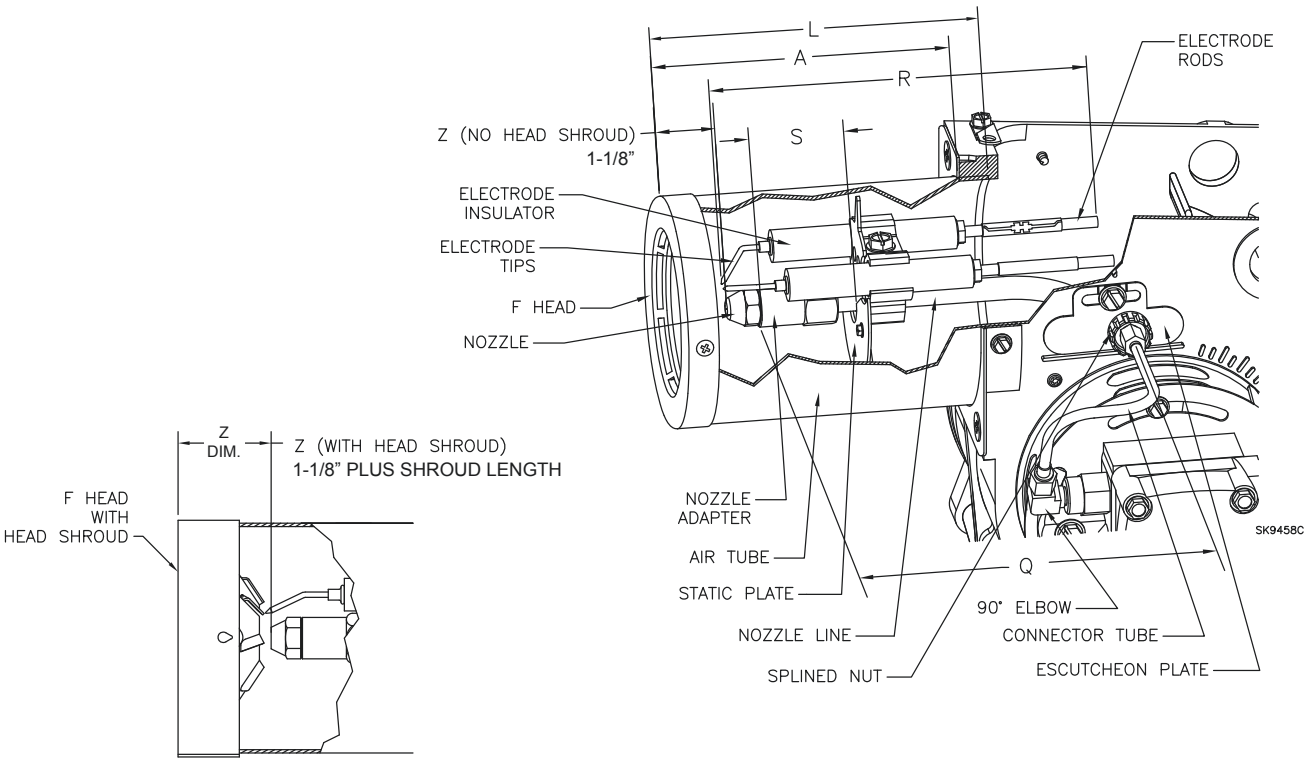
- Only use specified factory-welded flange and air tube combinations.

Bolt the burner to the appliance using the factory-mounted flange or an adjustable flange.

Mounting Dimensions

1. When using the Beckett universal adjustable flange, mount the air tube at a 2° downward pitch unless otherwise specified by the appliance manufacturer.
2. Verify that the air tube installed on the burner provides the correct insertion depth. See ***Figure 5***.
3. The end of the air tube should normally be 1/4" back from the inside wall of the combustion chamber. Never allow the leading edge of the head assembly to extend into the chamber, unless otherwise specified by the heating appliance manufacturer. Carefully measure the insertion depth when using an adjustable flange. Verify the insertion depth when using a welded flange.

Figure 4 – Check/Adjust 'Z' Dimension for 'F' Heads



WARNING **Adjust the 'Z' dimension to the required specification.**

Incorrect Adjustments could cause combustion problems, carbon deposition from flame impingement, heavy smoke generation and fire hazard.

- Make all adjustments exactly as outlined in the following information.

1. The important 'Z' dimension is the distance from the face of the nozzle to the flat face of the head (or heat shield, if applicable). This distance for F heads is 1-1/8" (1-3/8" if the air tube has a heat shield). The "Z" dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the "Z" dimension has not been changed.
2. Use the following procedure to adjust the "Z" dimension, if it is not correct:
   - Turn off power to the burner.
   - Disconnect the oil connector tube from the nozzle line
   - See above figure. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
   - Place the end of a ruler at the face of the nozzle and, using a straight edge across the head, measure the distance to the face of the head. A Beckett T501 or T650 gauge may also be used.
   - Slide the nozzle line forward or back until the Z dimension for F heads is 1-1/8" (1-1/8" plus shroud length, if using a straight edge).
   - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
3. Recheck the "Z" dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the "Z" dimension if you replace the air tube or nozzle line assembly. The Beckett Z gauge (part number Z-2000) is available to permit checking the F head "Z" dimension without removing the burner from the appliance.

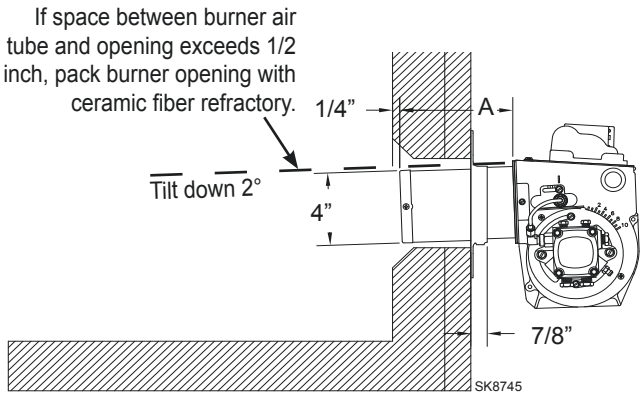
Burner Dimensions - Models SM & SF

Dimension (inches)	F Head
A = Usable air length (inches)	(Measure accurately)
L (Total tube length)	A Dim. + 1/2
R (electrode length), ± 1/4	A Dim. + 2-1/4
S (adapter to static plate), ± 1/16	(Note 1)
Q (nozzle line length),	A Dim. + 15/16
Z (F head w/o head shroud) (F head-with head shroud)	1-1/8 1-1/8 + shroud length. (Note 2)

Note 1: 1-3/8 for dimension A less than 4"; 1-5/8 for dimension A from 4" through 4-1/2 ", 2-13/32" for dimension A greater than 4-1/2".

Note 2: When using a straight edge.

Figure 5 – Mounting Burner in Appliance



Installing the Oil Tank and Supply System

WARNING **Oil Leak and Fire Hazard**

Install the oil tank following applicable standards in the U.S. by referring to the latest edition of NFPA 31 or CSA-B139 & CSA-B140 in Canada, and all authorities having jurisdiction.

CAUTION **Do Not Use Teflon Tape**

Damage to the pump could cause impaired burner operation, oil leakage and appliance soot-up.

- Never use Teflon tape on fuel oil fittings.
- Tape fragments can lodge in fuel line components and fuel unit, damaging the equipment and preventing proper operation.
- Use oil-resistant pipe sealant compounds.

Note: to determine the proper fuel line size, refer to the fuel pump manufacturer’s instructions provided with the burner. Refer to ***Figure 6*** or ***Figure 7*** for typical installation layouts.

NOTICE To further protect the fuel supply system and reduce nozzle orifice plugging, a dual filtration system can be installed. This typically consists of a 50 micron primary filter, located near the fuel tank and a secondary filter rated for at least 10 microns located near the burner.

Figure 6 – Inside Tank Gravity Feed System

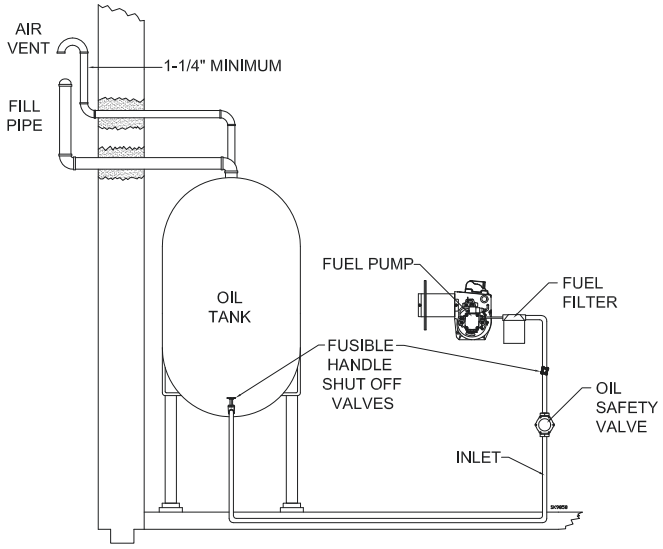
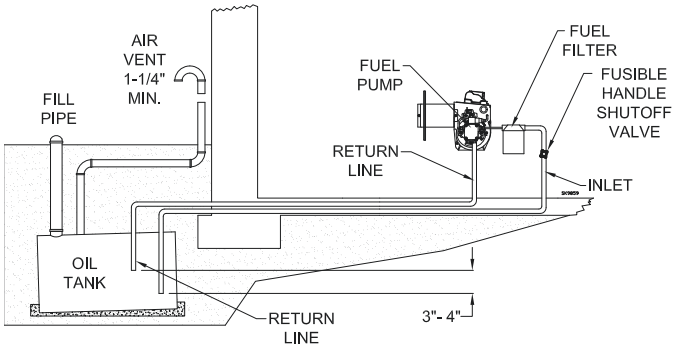


Figure 7 – Outside Buried Tank-Lift System



Connect Fuel Lines

Carefully follow the fuel unit manufacturer’s literature and the latest edition of NFPA 31 for oil supply system specifications (CSA B-139 in Canada).

Fuel supply level with or above burner –

The burner may be equipped with a single-stage fuel unit for these installations. Connect the fuel supply to the burner with a single supply line if you want a one-pipe system (making sure the bypass plug is NOT installed in the fuel unit.) Manual bleeding of the fuel unit is required on initial start-up. If connecting a two-pipe fuel supply, install the fuel unit bypass plug.

Fuel supply below the level of the burner –

When the fuel supply is more than eight feet below the level of the burner, a two-pipe fuel supply system is required. Depending on the fuel line diameter and horizontal and vertical length, the installation may also require a two-stage pump. Consult the fuel unit manufacturer's literature for lift and vacuum capability.

Fuel Line Installation –

⚠ CAUTION **Oil Supply Pressure Control Required**

Damage to the filter or pump seals could cause oil leakage and a fire hazard.

- The oil supply inlet pressure to the burner ***cannot exceed 3 psig***.
- Insure that a pressure limiting device is installed in accordance with the latest edition of NFPA 31.
- ***Do NOT install valves in the return line.*** (NFPA 31, Chapter 8.)
- ***Gravity Feed Systems***: Always install an oil safety valve (Webster OSV or Suntec PRV) in the oil supply line or a solenoid valve (RWB Part # 2182602U) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

Continuous lengths of 0.035" nominal wall (0.032" minimum) copper tubing are recommended. **Always use flare fittings. Never use compression fittings.**

- Always install fittings in accessible locations. Proper routing of fuel lines is required to prevent air cavitation and vibration.

Fuel Line Valve and Filter –

- Install two high quality, oil duty rated, fusible-handle design shutoff valves in accessible locations on the oil supply line to comply with the NFPA 31 Standard and authorities having jurisdiction. Locate one close to the tank and the other close to the burner, upstream of the filter for service access.
- Install a generous capacity filter inside the building between the fuel tank shutoff valve and the burner, locating both the filter and the valve close to the burner for ease of servicing. Filter should be rated for 50 microns or less.

Wire Burner

Burner Packaged with Appliance

⚠ WARNING **Electrical Shock Hazard**

Electrical shock can cause severe personal injury or death.

- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation.)
- Perform all wiring in compliance with the National Electrical Code ANSI/NFPA 70 (Canada CSA C22.1)

- Refer to appliance manufacturer's wiring diagram for electrical connections.

Burner Installed at Jobsite

- Refer to ***Figures 9a and 9b***, for typical burner wiring, showing cad cell primary controls. Burner wiring may vary, depending on primary control actually used.
- Refer to the appliance manufacturer's wiring diagram prior to connecting the burner wiring. All wiring must be in accordance with the latest revision of National Electric Code NFPA 70 and all local codes and regulations. In Canada, all wiring is to be in accordance with the Canadian Electrical Code, Part 1.

Both the 7505 and 7575 primary controls with valve-on delay (pre-time) and burner motor-off delay (post-time) require a constant 120 volts AC power source supplied to the BLACK wire on the control. The RED wire goes to the appliance limit circuit. **Please note that other control manufacturers may use different wire colors for power and limit connections.**

Burner Controls

SM burners shipped less Primary Control from RWB shall require Model 7575P Primary Control be installed with valve-on delay and motor-off delay to meet CSA B140.0 per wiring in ***Figure 9B***.

GeniSys 7505 & 7575

SM burners shall use the 7575P only.

⚠ WARNING **Fire or Explosion Hazard**

Can cause severe injury, death, or property damage.

- The control can malfunction if it gets wet, leading to accumulation of oil or explosive oil vapors.
- Never install where water can flood, drip or condense on the control.
- Never use a control that has been wet - replace it.

Features

- Thermostat / Operating and Limit Control Compatible
- Welded Relay Protection
- Limited Recycle
- Limited Reset
- 3 Status Lights
- Valve-On Delay / Motor-Off Delay (Field programmable with 52082 Contractor Tool)
- 15 Second Lockout Time
- Interrupted or Intermittent Duty Ignition
- Technician Pump Priming Mode
- Disable Function
- Communication Port(s)

Wiring

⚠ WARNING **Explosion, Fire, Scald, and Burn Hazard**

All heating appliances must have HIGH LIMIT protection to interrupt electrical power and shutdown the burner if operating or safety controls fail and cause a runaway condition.

- Follow the appliance manufacturer's wiring diagrams and note all required safety controls.
- Typical safety controls include high temperature or pressure limits, low water cutoffs, pressure relief valves and blocked flue sensing switches.
- Verify all limit and safety controls are installed and functioning correctly, as specified by the manufacturer, applicable safety standards, codes and all authorities having jurisdiction.
- Ensure that the appliance is free of oil and oil vapor before starting or resetting the burner.

⚠ CAUTION **Incorrect Wiring Will Result in Improper Control Operation**

- GeniSys wiring label colors may not match the wire colors of the burner or other manufacturers' controls.
- The GeniSys Control should be wired according to the appliance manufacturer's instructions.

Figure 8A – 7505 Control

Figure 8B – 7575 Control *(all connections are located on the bottom of the control.)*

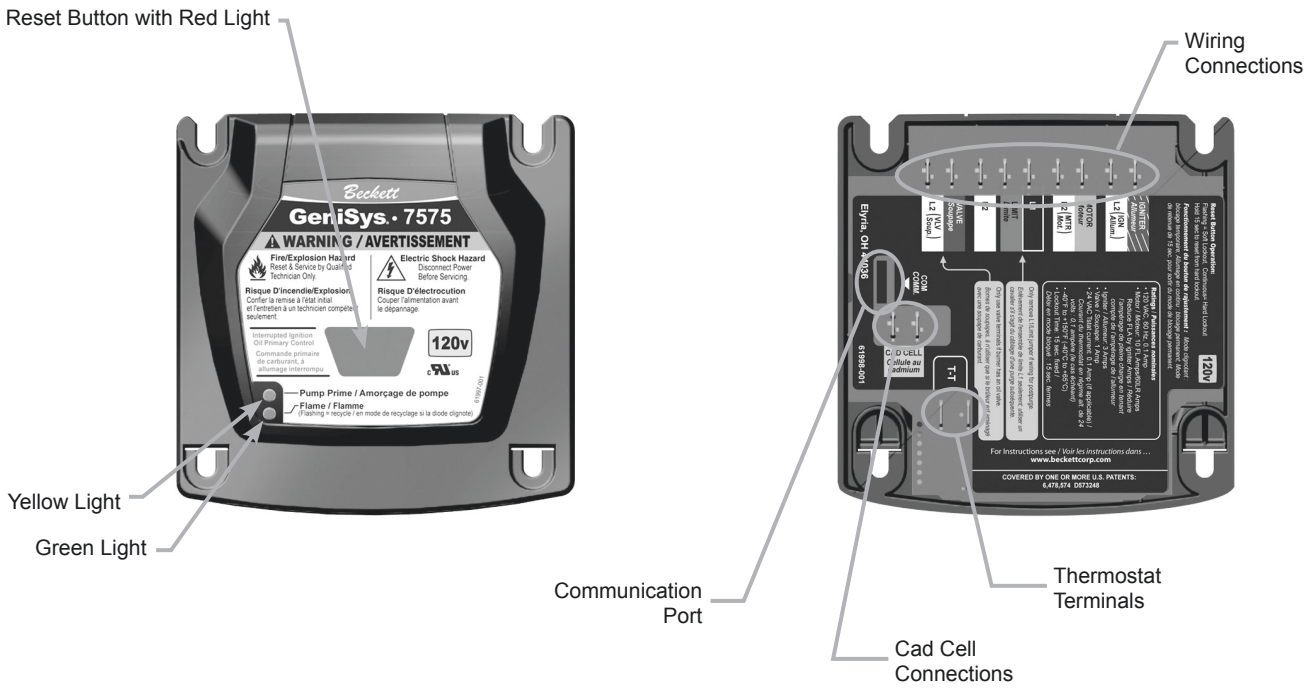
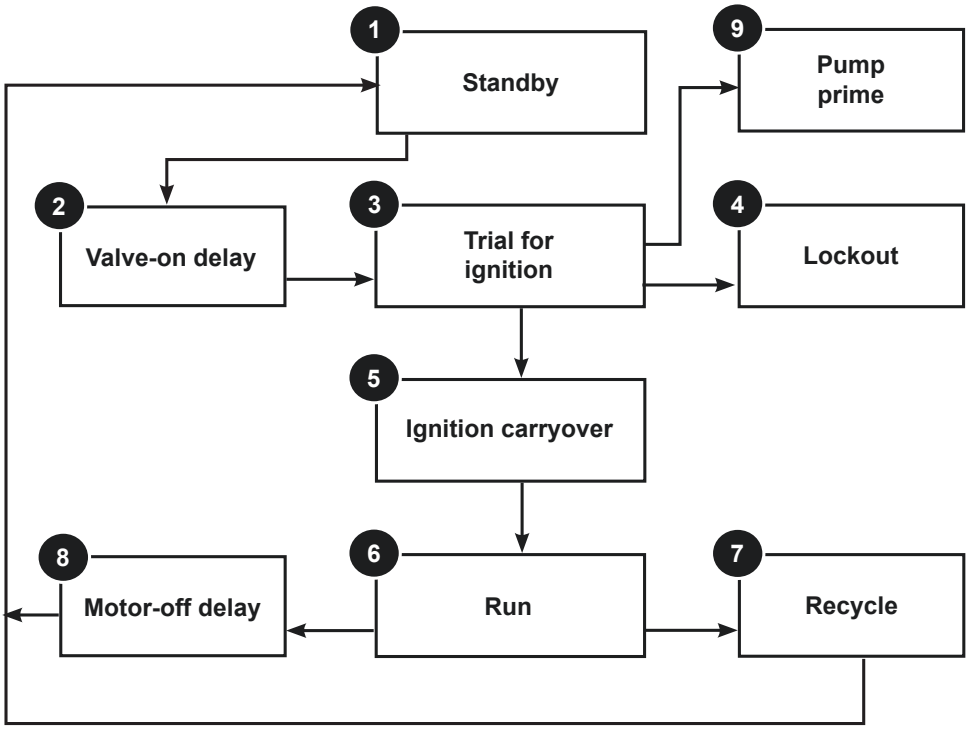


Figure 8C – Optional Components:

Contractor's Tool: Hand-held device for programming and diagnostics

Alarm Module: For adding isolated low voltage alarm contacts to the base control. See Alarm Module Instructions for specifications.

Typical Burner Sequence of Operation for GeniSys 7505 and 7575 Controls.
Refer to the appliance manufacturer's wiring diagram for actual specifications.



1. **Standby**: The burner is idle, waiting for a call for heat.
2. **Valve-On Delay**: The igniter and motor are on while the control delays turning on the oil solenoid valve for the programmed time.
3. **Trial For Ignition**: The oil solenoid valve is energized. A flame should be established within the factory set trial for ignition time (lockout time).
4. **Lockout**: The control has shut down for one of the following safety reasons:

   a. The trial for ignition (lockout) time expired without flame being established.
   b. The cad cell detected flame at the end of the Valve On Delay state.

   To reset the control from lockout click the button 1-second.

NOTE: A recurrence of the above failure modes or a failed welded relay check could cause the control to enter a **Hard Lockout** state that must be reset only by a qualified service technician.
To reset from Hard Lockout, hold the reset button for 15 seconds until the yellow light turns on.

5. **Ignition Carryover**: Once flame is established, the igniter remains on for 10 additional seconds to ensure flame stability.
6. **Run**: The flame is sustained until the call for heat is satisfied. The burner is then sent to Motor-Off Delay, if applicable, or it is shut down and sent to Standby.
7. **Recycle**: If the flame is lost while the burner is firing, the control shuts down the burner, enters a 60 second recycle delay, and repeats the ignition sequence. The control will continue to Recycle each time the flame is lost, until it reaches a pre-set time allotment. The control will then go into Hard Lockout instead of recycle. This feature prevents excessive accumulation of oil in the appliance firing chamber.
8. **Motor-Off Delay**: If applicable, the oil solenoid valve is turned off and the control delays turning the motor off for the set motor-off delay time before the control returns to standby.
9. **Pump Prime:** The igniter and motor are on with the oil solenoid valve energized for 4 minutes. During Pump Prime mode, the cad cell is disregarded, allowing the technician to prime the pump without having to jumper the cad cell.

Figure 9a – Interrupted ignition, valve-on delay only (no motor-off delay) – for SF Burners only.

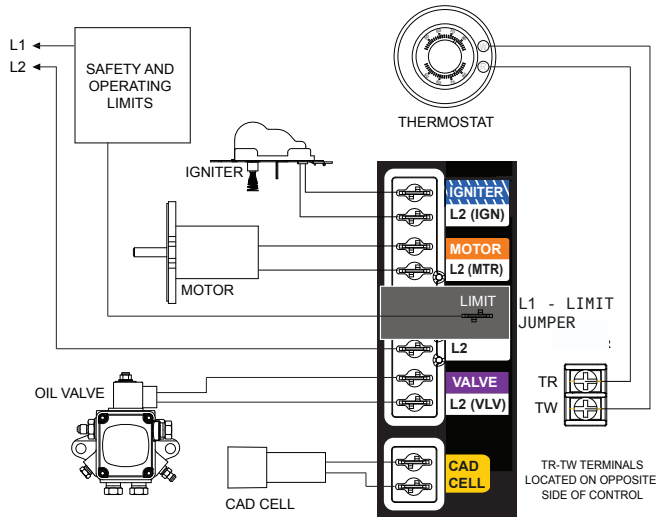
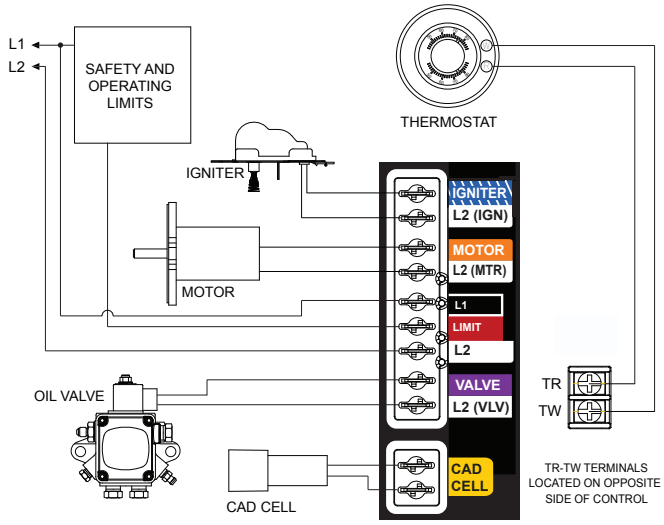


Figure 9b – Interrupted ignition, valve-on delay and motor-off delay – for SF and SM Burners.



Reset Button Operation

Table 2 explains what action the control will take when the reset button is pressed for different lengths of time during the various burner operating states.

Table 2 – Reset Button Operation

If the burner is in the below state:	Pushing the reset button will:		
	Button Click (press < 1 second)	Button Hold (press > 1 second)	Button Hold (press 15+ seconds)
Lockout	Reset from Soft Lockout		Reset from Restricted (Hard) Lockout
Valve-on Delay, Trial for Ignition, Ignition Carryover	Go to Pump Prime (see "Priming the Pump" above)	Disable the Burner: Any time the burner is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held.	Enables Pump Priming: After the reset button has been held for 15 seconds, the button can then be clicked during the next ignition sequence to enter Pump Prime mode.
Run (igniter is shut off)	No action		
Motor-Off Delay, Standby	No action		
Pump Prime	No action	Exit Pump Prime mode and return to Standby	

Table 3 – Status Lights

Light Color	On Continuously	Flashing
Red	Restricted (Hard) Lockout	Soft Lockout
Green	Flame Sensed during normal operation (Could be stray light during standby)	Recycle
Yellow	Control is in Pump Prime mode or Reset button currently held for 15+ seconds.	N/A

Wire Burner

NOTICE **Some Thermostats Are Polarity Sensitive. Reversed polarity could cause erratic cycling of the burner control**. Connect the wire from the RH or R terminal on the thermostat to the TR terminal on the control. Connect the wire from the W terminal on the thermostat to the TW terminal on the control.

- Make connections to the control's terminals as shown in ***Figures 9a and 9b***. Refer to the label on the underside of the control for wiring details.
- Note: Motor-off delay on a 7505P/7575P will be disabled if the safety and operating limits as shown in ***Figures 9a and 9b*** interrupt power to the control terminal L1.
- Connect thermostat leads to the TR and TW terminals on the control or jumper the TR and TW terminals on the control, as directed by the appliance wiring diagram.

  - Thermostat anticipator Current: 0.1 amp
  - Thermostat voltage: 24 volts AC

Note that if the thermostat short cycles or operates improperly, it may require an isolation relay for proper operation. The Beckett A/C Ready Kit (part no. 51950U) provides this function. Wiring instructions are included with the A/C Ready Kit.

Start Up Burner/Set Combustion

WARNING **Explosion and Fire Hazard**

Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.

- Do not attempt to start the burner when excess oil has accumulated in the appliance, the appliance is full of vapor, or when the combustion chamber is very hot.
- Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

1. Open the shutoff valves in the oil supply line to the burner.
2. If the air control is not preset, close air band and partially open air shutter. This is an initial air setting for the pump bleeding procedure only. Additional adjustments must be made with instruments to prevent smoke and carbon monoxide generation.
3. Set the thermostat substantially above room temperature.
4. Close the line voltage switch to start the burner. If the burner does not start immediately you may have to reset the safety switch of the burner primary control.
5. Bleed air from fuel unit as soon as burner motor starts rotating.
   - To bleed the fuel unit, attach a clear plastic hose over the vent fitting. Loosen the fitting and catch the oil in an empty container. Tighten the fitting when all air has been purged from the oil supply system.
   - If the burner locks out on safety during bleeding, reset the safety switch and complete the bleeding procedure. Note — Electronic safety switches can be reset immediately; others may require a three- to five-minute wait.
   - If burner stops after flame is established, additional bleeding is probably required. Repeat the bleeding procedure until the pump is primed and a flame is established when the vent fitting is closed.
   - For 7505/7575 primary controls, see Technician's Quick Reference Guide, part number 61666 for special pump priming sequence.
   - Prepare for combustion tests by drilling a ¼" sampling hole in the flue pipe between the appliance and the barometric draft regulator.
6. Initial air adjustment — Test the flue gas for smoke. Adjust the air shutter (and air band, if necessary) to obtain a clean flame. Now the additional combustion tests with instruments can be made.

Cad Cell Resistance Measurement

- The GeniSys Contractor Tool, part 52082U, can be used to read the cad cell resistance on the LCD screen.
- If this is not available, the cad cell leads can be unplugged from the control and the resistance measured with a meter in the conventional way. Conduct these tests with flame present.

Flame Detection Range
Normal = 0 to 1600 ohms
Limited = 1600 ohms to lockout

Resetting From Restricted or Hard Lockout

- If the control continues to lockout without a satisfied call for heat, or fails the motor relay check, the control enters Hard (restricted) Lockout in order to limit accumulation of unburned oil in the combustion chamber.

- To reset, hold the button down for 15 seconds until the red light turns off and the yellow light turns on.
- Always verify the control functions according to all specifications before leaving the installation site.
- Replace the control if it does not operate as specified.

Startup / Checkout

⚠ WARNING **Explosion and Fire Hazard**

Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.

- Do not attempt to start the burner when excess oil has accumulated in the appliance, the appliance is full of vapor, or when the combustion chamber is very hot.
- Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

If the burner or control fails any of the following tests, recheck control wiring. If the burner or control still fails any tests, replace the control.

Check Safety Features

Safe Start Check

1. Place a jumper across the cad cell terminals.
2. Refer to the steps for "Start up burner/set combustion" and have the system call for heat.
3. Burner must not start. Verify that the green light is on continuously and that the control remains in Standby mode.
4. End the call for heat and remove the cad cell jumper.

Simulate Flame Failure and Ignition Failure

1. Refer to the steps for "Start up burner/set combustion" and have the system call for heat.
2. After flame is established and the burner igniter turns off, close the hand valve in the oil supply line.
3. At flame loss, the control will enter Recycle mode. Verify that the green light is flashing. The control will remain in Recycle for 60 seconds.
4. After the 60 second recycle period, the control will try to restart the system.
5. After the 15 second lockout time, the control will lock out the burner and the reset button will flash. Verify that the burner motor and igniter are off and that the burner oil solenoid valve (if used) is not energized.
6. Open the hand valve in the oil line.
7. Click the reset button and verify that the red light in the reset button shuts off and that the burner lights.
8. End the call for heat.

Before leaving the installation, verify that all thermostat and boiler/furnace control wiring is correct. Consult heating appliance manual for directions.

Set combustion with instruments

⚠ CAUTION OIL-BURNING EQUIPMENT SHALL BE CONNECTED TO FLUES HAVING SUITABLE PRESSURE (DRAFT) AT ALL TIMES TO ASSURE SAFE AND PROPER OPERATION OF THE BURNER.

1. Allow the burner to run for approximately 5 to 10 minutes.
2. Set the stack or over-fire draft to the level specified by the appliance manufacturer.
   - **Natural Draft Applications;** typically over-fire draft is -0.01" or -0.02" w.c.
   - **Direct Venting**; typically may not require draft adjustment.
   - **High Efficiency/Positive Pressure Appliances**; also vary from traditional appliances (see manufacturer's recommendations).
3. Follow these four steps to properly adjust the burner:

   Step 1: Adjust the air shutter/band until a trace of smoke is achieved.

   Step 2: At the trace of smoke level, measure the CO_2 (or O_2) . This is the vital reference point for further adjustments. Example: 13.5% CO_2 (2.6% O_2).

   Step 3: Increase the air to reduce the CO_2 by 1.5 to 2 percentage points. (O_2 will be increased by approximately 2.0 to 2.7 percentage points.) *Example:* Reduce CO_2 from 13.5% to 11.5% (2.6% to 5.3% O_2).

   Step 4: Recheck smoke level. It should be Zero.
   - This procedure provides a margin of reserve air to accommodate variable conditions.

– If the draft level has changed, recheck the smoke and CO_2 levels and readjust the burner, if necessary

4. Once combustion is set, tighten all fasteners on air band, air shutter and escutcheon plate.
5. Start and stop the burner several times to ensure satisfactory operation. Test the primary control and all other appliance safety controls to verify that they function according to the manufacturer's specifications.

Perform Regular Maintenance

WARNING **Annual Professional Service Required**

Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- DO NOT TAMPER WITH THE UNIT OR CONTROLS - CALL YOUR QUALIFIED SERVICE TECHNICIAN OR SERVICE PERSONNEL.
- To ensure continued reliable operation, a qualified service technician must service this burner annually.
- More frequent service intervals may be required in dusty or adverse environments.
- Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

- □ Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- □ Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- □ Remove and clean the pump strainer if applicable.
- □ Replace the nozzle with the exact brand, pattern, gph flow rate and spray angle..
- □ Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- □ Check electrode tip settings. Replace electrodes if tips are rounded.
- □ Inspect the igniter spring contacts.
- □ Clean the cad cell lens surface, if necessary.
- □ Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- □ Inspect the combustion head and air tube. Remove any carbon or foreign matter. Replace all damaged units with exact parts.
- □ Clean the blower wheel, air inlet, air guide, burner housing and static plate of any lint or foreign material.
- □ If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.
- □ Check motor current. The amp draw should not exceed the nameplate rating.
- □ Check all wiring for secure connections or insulation breaks.
- □ Check the pump pressure and cutoff function.
- □ Check primary control safety lockout timing.
- □ Check ignition system for proper operation.
- □ Inspect the vent system and chimney for soot accumulation or other restriction.
- □ Clean all flue passages and flue pipe. Replace corroded or damaged pipes.
- □ Clean the appliance thoroughly according to the manufacturer's recommendations.
- □ Check the burner performance. Refer to the section "Set combustion with test instruments".
- □ It is good practice to make a record of the service performed and the combustion test results.

Shutting the Burner Off

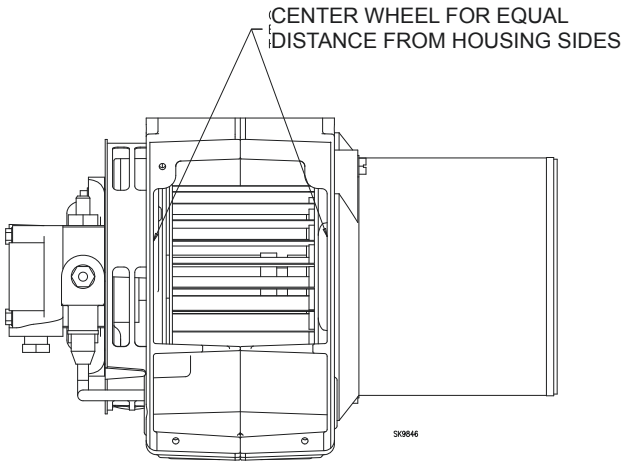
CAUTION **ALWAYS KEEP THE FUEL OIL SUPPLY VALVE SHUT OFF IF THE BURNER(S) IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.**

Turn off all electric power to the burner.
Note: There could be more than one disconnect switch.

Replacing the blower wheel:

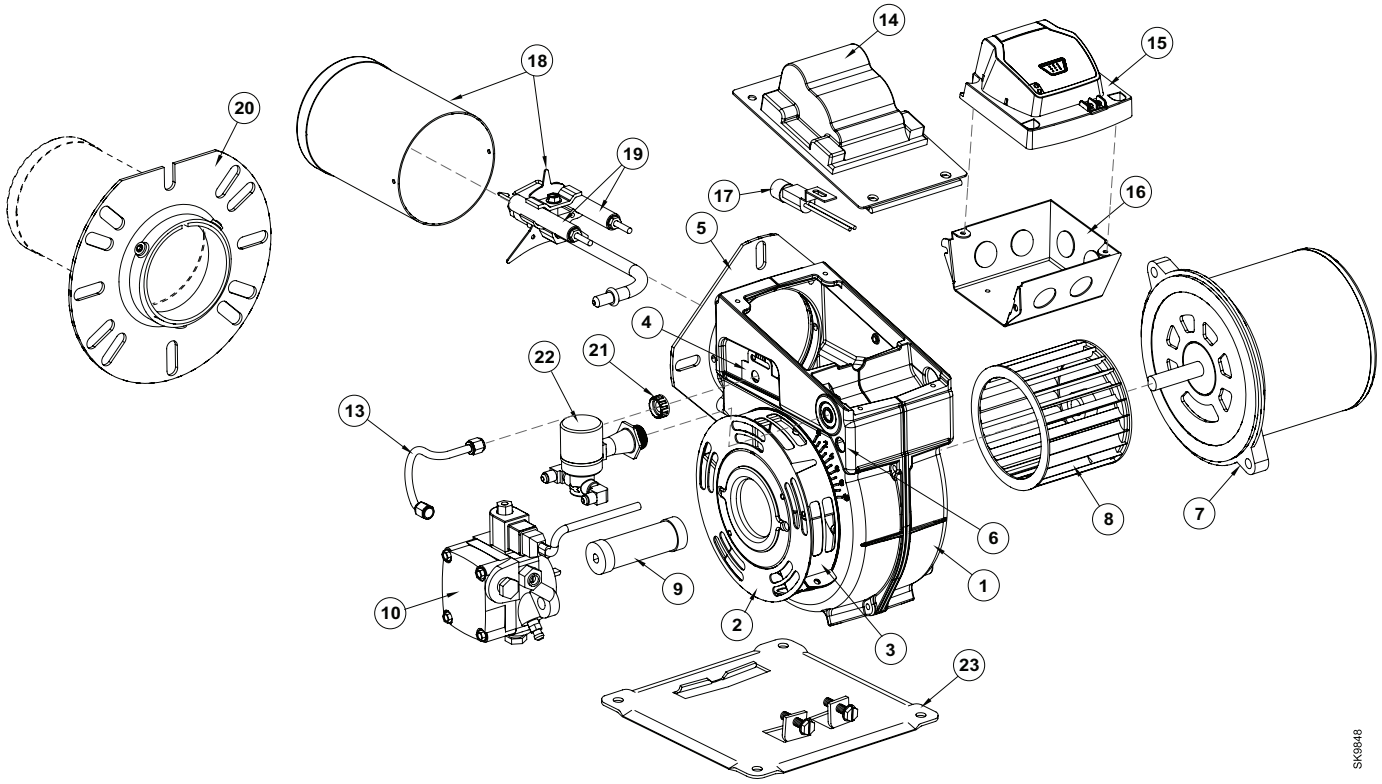
When replacing the blower wheel, insure that the wheel is centered between the two sides of the burner housing as shown below.

Figure 10 – Blower Wheel Assembly



Replacement Parts

For best performance specify genuine *Beckett* replacement parts



#	Part No.	Description
1		Burner Housing Assembly with Inlet Bell
2	3215	Air shutter, 10 Slot
3	3819	Bulk Air Band, 10 Slot
4	3493	Nozzle-line Escutcheon Plate
5	Specify ** 3399	Unit Flange or Square Plate
	3416	Air Tube Gasket (not shown)
6	2139	Hole Plug - Wiring Box
7	2900U 2364U	Drive Motor, 1/5 HP (SM Models) Drive Motor, 1/4 HP (SF Models)
8	2383U	Blower Wheel (6-1/4 X 3-7/16)
9	2433	Flexible Coupling (Fits 5/16" pump shaft)
10	2591U 21188U	Fuel Units SF only Single-Stage 'A' Two-Stage 'B'
	2184404U 2460	Fuel Units SM only CleanCut Single-Stage 'A'
--	2256	Pump outlet fitting (not shown)
--	482	Pump holding screws (not shown)

#	Part No.	Description
13	5394	Connector tube assembly, pump to nozzle line
14	51824U	Igniter and Base Plate
14	2289U	Ignition Transformer (10,000 V/23mA)
15	7505A/7575A	Replaces R7184A - Interrupted Ignition
	7505B/7575B	Replaces R7184B - Pre-time
	7505P/7575P	Replaces R7184P - Pre and Post-time (7575P used for all SM burners)
16	5770	Electrical Box
17	7006U	Cad Cell Detector
18	Specify **	Air Tube Combination
19	5780	Electrode Kit - F Head up to 9"
	5782	Electrode Kit - F Head over 9"
20	5432 3616	Universal Flange w/ Gasket Gasket Only
21	3666	Splined Nut
22	2182602U	Blocking Oil Solenoid Valve
23	5685	Base Pedestal Kit
** Contact your Beckett Representative for part number and pricing.		

WIC 301 BURNER

Beckett
COMMERCIAL

CF1400
CF2300

OIL BURNER MANUAL

Operation: Low/High
Rate: CF1400: 4.0 to 13.6 GPH
CF2300: 7.0 to 19.9 GPH

WARNING **Potential for Fire, Smoke and Asphyxiation Hazards**

Incorrect installation, adjustment, or misuse of this burner could result in death, severe personal injury, or substantial property damage.

To the Homeowner or Equipment Owner:

- Please read and carefully follow all instructions provided in this manual regarding your responsibilities in caring for your heating equipment.
- Contact a professional, qualified service agency for installation, start-up or service work.
- Save this manual for future reference.

To the Professional, Qualified Installer or Service Agency:

- Please read and carefully follow all instructions provided in this manual before installing, starting, or servicing this burner or heating system.
- The Installation must be made in accordance with all state and local codes having jurisdiction.

Before you begin . . .

The following resources will give you additional information for your installation. We suggest that you consult these resources whenever possible. Pay particular attention to the appliance manufacturer's instructions.

Appliance manufacturer's instructions *-Always follow the appliance manufacturer's instructions for burner installation, equipment and set-up.*

1–800–OIL–BURN *- Beckett's technical services hot-line.*
www.beckettcorp.com *- Beckett's website.*

To the Owner:

Thank you for purchasing a Beckett burner for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your oil burner.

Your Beckett burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

We recommend annual inspection/service of your oil heating system by a qualified service agency.

Table of Contents

Hazard definitions

DANGER **Indicates an imminently hazardous situation, which, if not avoided, will result in death, serious injury, or property damage.**

WARNING **Indicates a potentially hazardous situation, which, if not avoided, could result in death, severe personal injury, and/or substantial property damage.**

CAUTION **Indicates a potentially hazardous situation, which, if not avoided, may result in personal injury or property damage.**

NOTICE

Intended to bring special attention to information, but not related to personal injury or property damage.

Note: Within the boundaries of the hazard warning, there will be information presented describing consequences if the warning is not heeded and instructions on how to avoid the hazard.

Agency approvals

- UL listed to comply with ANSI/UL296 and certified to CSA B140.0.
- Accepted by N.Y.C. M.E.A.
- Other approvals may be available and must be specified at time of order.

Specifications

Fuels	#1 or #2 Fuel Oil
Firing Range	BCF1400 - 4.0 to 13.6 gph BCF2300 - 7.0 to 19.9 gph
Motor	**CF1400:** 1/2 HP 3450 rpm 120/60 Hz Standard 6.5 amps @ 120 VAC **CF2300:** 3/4 HP 3450 rpm 120/60 Hz Standard 12.5 amps @ 120 VAC **Optional Voltages** (CF1400 & CF2300): 240 VAC/1-PH, 208, 240, 480 VAC/3-PH, 50 Hz
Ignition Trans.	Continuous Duty, 120V/12,000V
Housing	Cast aluminum
Fuel Unit	100 to 300 psig
Oil Nozzle	45° to 70° Solid
Dimensions	Refer to Figure 7.

Owner's Responsibility:

WARNING **Follow These Instructions Exactly**

Failure to follow these instructions, misuse, or incorrect adjustment of the burner could lead to equipment malfunction and result in asphyxiation, explosion or fire.

Contact a professional, qualified service agency for the installation, adjustment and service of your oil burning system. Thereafter, have your equipment adjusted and inspected at least annually to ensure reliable operation. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

Please carefully read and comply with the following instructions:

- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

Professional Installer/Service Agency Responsibility:

WARNING **Follow These Instructions Exactly**

Failure to follow these instructions could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- Please read all instructions before proceeding. Follow all instructions completely.
- This equipment must be installed, adjusted and started by a qualified service agency that is licensed and experienced with all applicable codes and ordinances and responsible for the installation and commission of the equipment.
- The installation must comply with all local codes and ordinances having jurisdiction and the latest editions of the NFPA 31 and CSA-B139 & B140 in Canada.

NOTICE

50 Hz Motors - The burner ratings, air settings and nozzle ratings are based on standard 60 Hz motors (at 3450 rpm). Derate all ratings 20% when using 50 hz motors. Consult factory for specific application data.

NOTICE

High altitude installation - Accepted industry practice requires no derate of burner capacity up to 2000 feet above sea level. For altitudes higher than 2000 feet, derate burner capacity 2% for each 1000 feet above sea level.

Pre-installation checklist

❑ Combustion air supply

WARNING **Adequate Combustion and Ventilation Air Supply Required**

Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment, asphyxiation, explosion or fire hazards.

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest editions of the NFPA 31 and CSA-B139 regarding providing adequate air for combustion and ventilation.

The burner requires combustion air and ventilation air for reliable operation. Assure that the building and/or combustion air openings comply with National Fire Protection Standard for Oil-Burning Equipment, NFPA 31. For appliance/burner units in confined spaces, the room must have an air opening near the top of the room plus one near the floor, each with a free area at least one square inch per 1,000 Btu/hr input of all fuel burning equipment in the room. For other conditions, refer to NFPA 31 (CSA B1139-M91 in Canada).

If there is a risk of the space being under negative pressure or of exhaust fans or other devices depleting available air for combustion and ventilation, the appliance/burner should be installed in an isolated room provided with outside combustion air.

❑ Clearances

With the burner installed in the appliance, there must be adequate space in front of and on the sides of the burner to allow access and operation. Verify that the clearance dimensions comply with all local codes and with the appliance manufacturer's recommendations.

❑ Fuel supply

CAUTION

Oil Supply Pressure Control Required

Damage to the filter or pump seals could cause oil leakage and a fire hazard.

- The oil supply inlet pressure to the burner ***cannot exceed 3 psig***.
- Do not install valves in return line.
- Insure that a pressure limiting device is installed in accordance with the latest edition of NFPA 31.
- Gravity Feed Systems: Always install an anti-siphon valve in the oil supply line or a solenoid valve (RWB Part # 21789) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

- The fuel supply piping and tank must provide #1 or #2 fuel oil at pressure or vacuum conditions suitable for the fuel unit (oil pump) on the burner. Refer to fuel unit literature in the literature envelope in the burner carton to verify allowable suction pressure.

If fuel supply is level with or higher than fuel unit —

- When the fuel unit is not required to lift the oil, the installation is usually suitable for either a one-pipe or two-pipe oil system. The oil pressure at the inlet of the fuel unit must not exceed 3 psig.
- The fuel unit is shipped with the by-pass plug installed. Leave the by-pass plug installed for all low/high firing burners, regardless whether one-pipe (with by-pass loop) or two-pipe. See ***Figure 9*** for installation of the by-pass loop required for one-pipe fuel supply installations. See ***Figure 10*** for connections to the fuel unit for two-pipe fuel supply installations.

When fuel supply is below the burner fuel unit —

- Use a two-pipe oil system when the fuel unit must lift the oil more than 8 feet. The return line provided by the two-pipe system is needed to minimize the effects of air-related problems during operation.

❑ Nozzle pressure

WARNING

Correct Nozzle and Flow Rate Required

Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, sooting, puff-back of hot gases, smoke and potential fire or asphyxiation hazards.

Use only nozzles having the brand, flow rate (gph), spray angle and pattern specified by the appliance manufacturer.

Follow the appliance manufacturer's specifications for the required pump outlet pressure for the nozzle, since this affects the flow rate.

- Nozzle manufacturers calibrate nozzle flow rates at 100 psig.
- This burner utilizes pressures higher than 100 psig, so the actual nozzle flow rate will be greater than the gph stamped on the nozzle body. (Example: A 8.00 gph nozzle at 150 psig = 9.80 gph and at 300 psig = 13.86 gph)

For typical nozzle flow rates at various pressures see accompanying chart.

- The fuel unit nozzle port pressure is factory set at 300 psig. Some original equipment manufacturer burner applications may call for a lower pressure to obtain a required firing rate. Do not change this pressure unless directed to do so by the appliance manufacturer.

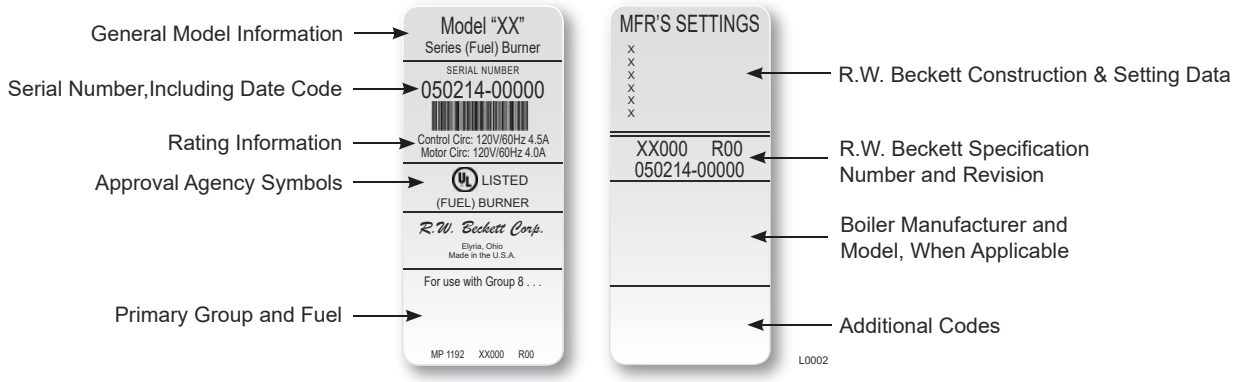
❑ Electrical supply

Verify that the power connections available are correct for the burner. Refer to ***Figure 1***. All power must be supplied through fused disconnect switches.

❑ Vent system

The flue gas venting system must be in good condition and must comply with all applicable codes.

Figure 1 – Typical Nameplate



❑ Verify burner components —

- Burner nameplate ***(figure 1)***, Model CF1400 or CF2300A
- Air tube assembly
- Mounting flange kit
- Pedestal mounting assembly kit (recommended)
- Oil nozzle, per ***Table 1*** — Use only 45° to 70° solid pattern nozzles unless otherwise shown by appliance manufacturer or on the burner nameplate rating label.

Find the required firing rate in the 300 psig column (high fire rate).
Select the corresponding nozzle from column 1 (***Rated gph @ 100 psig***).

(Example: a 500 gph nozzle @ 300 psi = 8.66 gph)

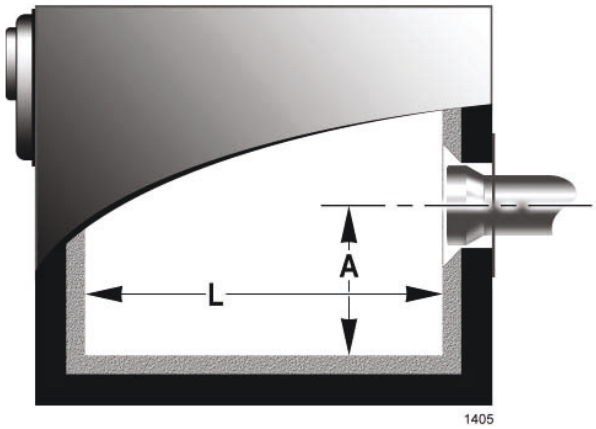
Table 1 - Nozzle capacities

Rated gph @ 100 psig	Pressure - Pounds per square inch							
	125	140	150	175	200	250	275	300
3.00	3.35	-	3.67	3.97	4.24	4.74	4.97	5.20
3.50	3.91	-	4.29	4.63	4.95	5.53	5.80	6.06
4.00	4.47	-	4.90	5.29	5.66	6.32	6.63	6.93
4.50	5.04	5.32	5.51	5.95	6.36	7.11	7.46	7.79
5.00	5.59	5.92	6.12	6.61	7.07	7.91	8.29	8.66
5.50	6.15	6.51	6.74	7.27	7.78	8.70	9.12	9.53
6.00	6.71	7.10	7.35	7.94	8.49	9.49	9.95	10.39
6.50	7.26	7.69	7.96	8.60	9.19	10.28	10.78	11.26
7.00	7.82	8.28	8.57	9.25	9.90	11.07	11.61	12.12
7.50	8.38	8.87	9.19	9.91	10.61	11.86	12.44	12.99
8.00	8.94	9.47	9.80	10.58	11.31	12.65	13.27	13.86
8.50	9.50	10.06	10.41	11.27	12.02	13.44	14.10	14.72
9.00	10.06	10.65	11.02	11.91	12.73	14.23	14.93	15.59
9.50	10.60	11.24	11.64	12.60	13.44	15.02	15.75	16.45
10.00	11.18	11.83	12.25	13.23	14.14	15.81	16.58	17.32
10.50	11.74	12.42	12.86	13.89	14.85	16.60	17.41	18.19
11.00	12.30	13.02	13.47	14.55	15.56	17.39	18.24	19.05
12.00	13.42	14.20	14.70	15.88	16.97	18.97	19.90	20.79

❑ Verify firing rate

Refer to appliance manufacturer's instructions (if available) for firing rate and nozzle selection. Otherwise, the maximum recommended firing rate for the burner depends on the length of the firing chamber and the distance from the burner center to the chamber floor. Verify that the chamber dimensions are at least as large as the minimum values given in ***Figure 2***. If the appliance dimensions are smaller than recommended, reduce the firing rate accordingly.

Figure 2 – Chamber Dimensions



Model	Firing Rate (gph)	Minimum Dimensions			
		Refractory Lined		Wet-based Boilers	
		A	L	A	L
CF1400	0 to 5	7.0"	25.0"	7.0"	25.0"
	5 to 10	8.0"	35.0"	8.0"	40.0"
CF2300	5 to 10	8.0"	35.0"	8.0"	40.0"
	10 to 15	9.0"	40.0"	9.0"	50.0"
	15 to 20	11.0"	55.0"	11.0"	60.0"

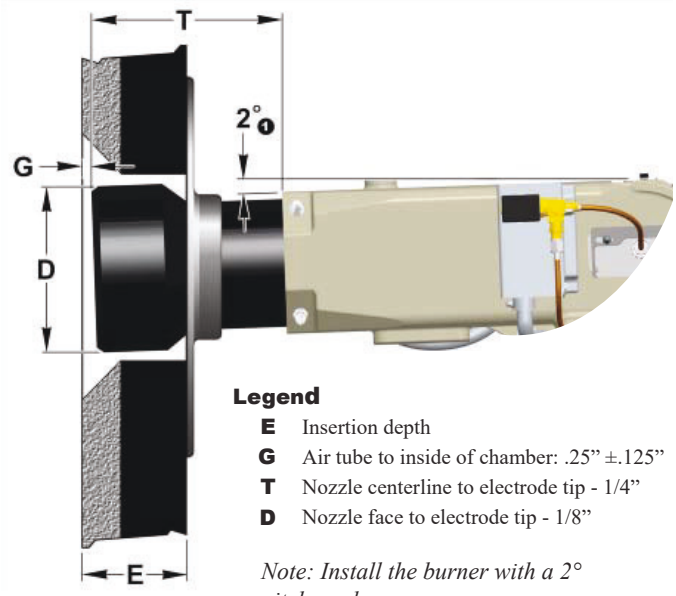
❑ Verify air tube

The information in this section may be disregarded if the air tube is supplied by the appliance manufacturer.

- On the **CF1400**, there are two tube arrangements available –
  Tube A — 4.0 to 11.0 GPH per Table 2
  Tube B — 7.0 to 13.6 GPH per Table 2
- The **CF1400** maximum firing capacity depends on the firebox pressure. Use ***Table 2*** to verify the correct air tube type for the firing rate required. Use Tube B only when Tube A cannot provide the firing rate required.

- On the **CF2300**, there are two tube arrangements available –
  Tube A — 7.0 to 19.9 GPH per Table 2
  Tube B — 10.0 to 19.9 GPH per Table 2
- The **CF2300** maximum firing capacity depends on the firebox pressure. Use ***Table 2*** to verify the correct air tube type for the firing rate required. Use Tube B only when Tube A cannot provide the firing rate required.
- See ***Figure 3*** to verify the correct air tube length and air tube combination code.

Figure 3 – Air tube mounting dimensions



Legend

- **E** Insertion depth
- **G** Air tube to inside of chamber: .25” ±.125”
- **T** Nozzle centerline to electrode tip - 1/4”
- **D** Nozzle face to electrode tip - 1/8”

Note: Install the burner with a 2° pitch as shown.

Air Tube Combination Codes					
Model	Tube	Dimension T	Dimension D	Code	Dimension E
CF1400	A	6.75”	5.5”	CF 66 KD	-
		10.25”	5.5”	CF 102 KD	-
		13.75”	5.5”	CF 136 KD	-
		17.75”	5.5”	CF 176 KD	-
	B	6.75”	5.75”	CF 66 KE	-
		10.25”	5.75”	CF 102 KE	-
		13.75”	5.75”	CF 136 KE	-
		17.75”	5.75”	CF 176 KE	-
CF2300	A	6.75”	6.5”	CF 66 KG	2.94”
		10.25”	6.5”	CF 102 KG	2.94”
		13.75”	6.5”	CF 136 KG	2.94”
		17.75”	6.5”	CF 176 KG	2.94”
	B	6.75”	8.125”	CF 66 KS	3.69”
		8.375”	8.125”	CF 86 KS	3.69”
		11.0”	8.125”	CF 110 KS	3.69”
		14.5”	8.125”	CF 144 KS	3.69”
		18.5”	8.125”	CF 184 KS	3.69”

Table 2 - Air tube capacity Versus firebox pressure

Air Tube Capacity vs Firebox Pressure				
Model	Tube	Firebox Pressure (In W.C.)	No Reserve Air	10% Turndown* (GPH)
CF1400	A	0.0	11.0	10.0
		0.2	10.5	9.45
		0.4	10.1	9.10
		0.6	9.6	8.64
		0.8	9.2	8.30
		1.0	8.7	7.83
	B	0.0	13.6	12.20
		0.2	13.1	11.70
		0.4	12.5	11.20
		0.6	12.0	10.80
		0.8	11.4	10.30
		1.0	10.9	9.80
CF2300	A	0.0	19.9	19.90
		0.2	19.2	19.10
		0.4	18.5	18.30
		0.6	17.9	17.60
		0.8	17.2	16.80
		1.0	16.5	16.00
	B	0.0	19.9	19.90
		0.2	19.7	19.60
		0.4	19.5	19.30
		0.6	19.4	19.10
		0.8	19.2	18.80
		1.0	19.0	18.50

Note: 10% turndown indicates sufficient reserve air to reduce the CO_2 in the flue to 90% of its value. The above ratings may vary 5% due to variations in actual job conditions.

***CF2300** can fire higher but is limited by UL requirements

❑ Stray light

CAUTION

Protect Against Stray Light Lockout

Failure to follow these instructions could cause loss of burner operation resulting in no heat, an unplanned process interruption, work stoppage and the potential for frozen plumbing or other cold weather property damage.

- The control must detect a dark, no-flame condition in order to start the burner or it will hold in the stray light lockout mode.
- Shield the burner view window from direct exposure to intense light.

❑ Dust and Moisture

WARNING

Protect Against Dust and Moisture

Wet, dusty environments could lead to blocked air passages, corrosion damage to components, impaired combustion performance and result in asphyxiation, explosion or fire.

- This burner is designed for clean, dry installations.
- Electrical controls are not protected against rain or sprayed water.
- Keep the installation clear of dust, dirt, corrosive vapors, and moisture.
- Protective covers and more frequent maintenance may be required.

Mount the burner

❑ Mount flange(s) on air tube

CAUTION

Protect the Air Tube From Overheating

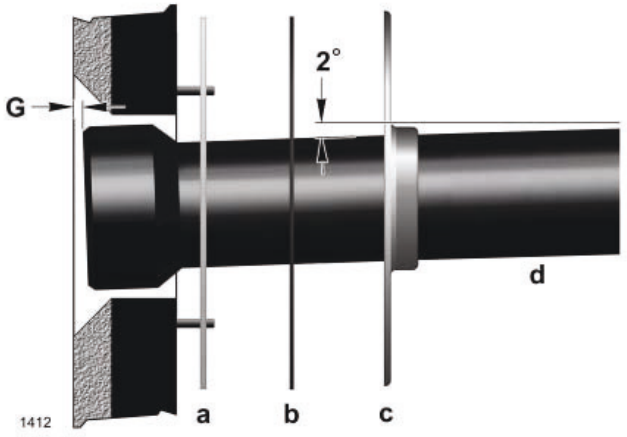
Overheating could cause damage to the air tube and other combustion components leading to equipment malfunction and impaired combustion performance.

- The end of the air tube must not extend into the combustion chamber unprotected unless it has been factory-tested and specified by the appliance manufacturer.
- Position the end of the air tube 1/4” back from flush with the refractory inside entry wall to prevent damage from overheating.

This section does not apply to burners with welded flanges.

- Do not install air tube on burner.
- For non-pressure firing flange, refer to ***Figure 4***: Install gasket (item **a**) and flange (item **c**). Ignore the next paragraph.
- For pressure-firing flange, refer to ***Figure 4***: Slide gasket (item **a**) onto the air tube, making sure the top of the air tube is up. Predrill holes in the pressure firing plate (item **b**) to match the appliance studs. Slide the pressure firing plate (item **b**) and flange (item **d**) onto the air tube as shown. Wrap ceramic fiber rope (not shown) around the air tube and press tightly into the inside diameter of the flange (item **c**).
- Slide the air tube (item **d**) into position in the appliance front. Tighten the flange-mounting-stud nuts. Set the insertion of the air tube so dimension **G** is **1/4”** nominal.
- Pitch the air tube at 2° from horizontal as shown and secure the flange to the air tube.

Figure 4 – Mount flange(s) on air tube



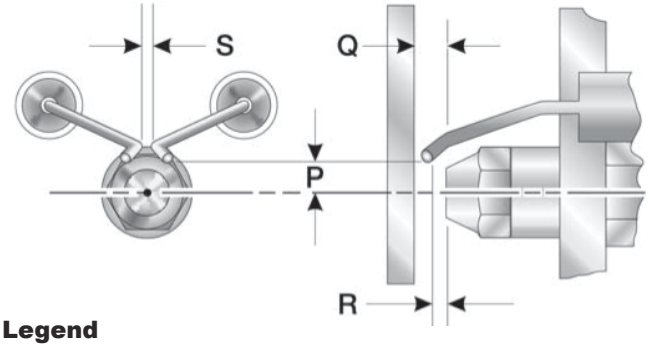
❑ Mount air tube to burner

- Remove the rear access door from the back of the burner for improved access to the interior.
- Attach the air tube to the burner with the bolts and acorn nuts provided. The acorn nuts must go on the outside of the burner, with the bolts inserted from the inside.

❑ Install nozzle

See ***Figure 5***. Install the oil nozzle in the nozzle adapter. Use a **3/4"** open-end wrench to steady the nozzle adapter and a **5/8"** open-end wrench to turn the nozzle. Tighten securely but do not overtighten.
Check, and adjust if necessary, the critical dimensions **P**, **Q**, **R** and **S** shown in the drawing. Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

Figure 5 – Nozzle and nozzle line assembly



Legend

- **S** Electrode spacing - 3/32"
- **Q** Nozzle to head - 1/4"
- **P** Nozzle centerline to electrode tip - 1/4"
- **R** Nozzle face to electrode tip - 1/8"

❑ Check electrode settings

WARNING **Maintain Electrode Specifications**

Failure to properly maintain these specifications could cause ignition malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire hazards.

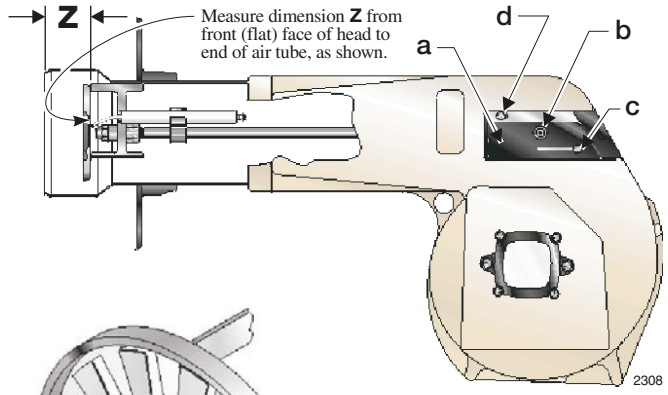
- Adjust the electrode gap and position in relation to the nozzle to the specifications shown in ***Figure 5***.

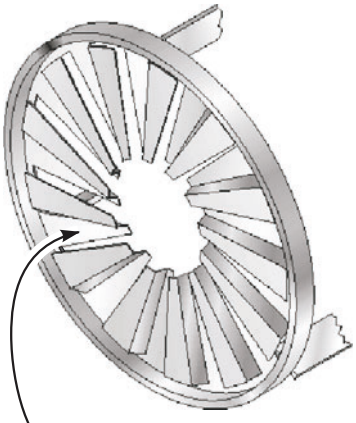
Check, and adjust if necessary, the critical dimensions shown in ***Figure 5***. Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

❑ Install nozzle line assembly

- Insert the nozzle line assembly into the burner air tube as in ***Figure 6.***
- See ***Figures 6 and 7***. Assemble the adjusting plate assembly per the instructions in the assembly packet.
- Slide the secondary adjusting plate (item **f**) completely to the left on the indicator adjusting plate (item **e**). Finger-tighten acorn nut (item **c**) to secure the two plates together. Slide both plates completely to the left on the primary adjusting plate (item **g**) and finger-tighten acorn nut (item **d**).
- Slide the completed adjusting plate assembly over the nozzle line end. Move the plate assembly and the nozzle line so the plate assembly fits into position as shown in ***Figure 6***.
- Install the spline nut (***Figure 6***, item **b**) on the end of the nozzle line, leaving the nut loosely placed so the plates can be moved.
- Connect the high-voltage leads from the ignition transformer to the electrodes.

Figure 6 – Nozzle line assembly in burner





Z = 1-3/4" ± 1/16"

Legend (Figure 6)

- **a** Adjusting plate assembly
- **b** Spline nut for securing nozzle line
- **c** Bottom acorn nut
- **d** Top acorn nut (for setting dim. Z only)

❑ Set dimension Z

- Replace the rear access door on the burner, making sure that the adjusting plate assembly is now securely in the groove.
- Loosen acorn nut (item **d**) in ***Figure 5***. Slide the nozzle line and plate assembly until dimension Z in ***Figure 5*** is **1-3/4 ±1/16”** (CF1400 and CF2300). When dimension Z (from end of air tube to flat area of front face of head) is correctly set, tighten acorn nut (item **d**). Verify that the adjusting plate assembly is properly seated in the groove.
- Attach the oil line from the oil valve to the nozzle line end. Tighten securely.
- Before proceeding, check dimension Z once again. Loosen acorn nut (item **d**) if necessary to reposition the nozzle line. Once dimension Z is set, **do not loosen acorn nut** (item **d**) again.

❑ Insert burner

- Position the burner in the front of the appliance and loosely tighten the nuts on the mounting studs. The burner should be pitched downward 2° as shown in ***Figures 4 and 8***.
- See ***Figure 8***. Install the pedestal support kit (recommended) by attaching the **3/4”** npt flange (item **a**) to the bottom of the burner using the (4) #10 screws provided. Cut and thread (one end only) a **3/4”** pipe nipple (item **b**) **with length 11 inches less than dimension D** in ***Figure 8***. Thread the pipe into the flange. Then slip the pipe end into the floor flange (item **c**).
- Secure the burner to the appliance by tightening the nuts on the burner flange mounting studs. Then secure the pedestal support floor flange set screw to the pipe.

Figure 7 – Adjusting plate assy.

Legend

- **a** Adjusting plate assembly
- **b** Spline nut for securing nozzle line
- **c** Bottom acorn nut
- **d** Top acorn nut (for setting dim. Z only)
- **e** Indicator adjusting plate
- **f** Secondary adjusting plate
- **g** Primary adjusting plate

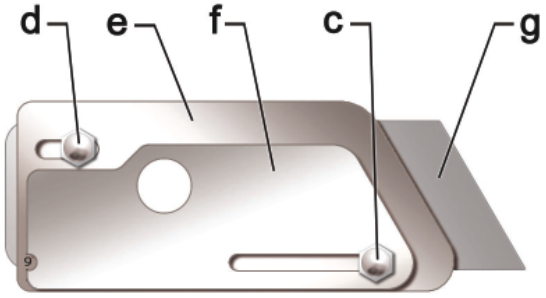
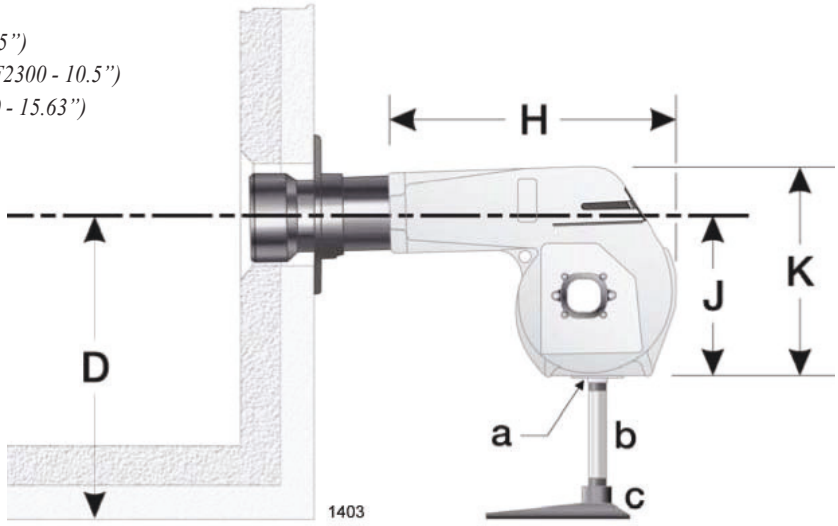


Figure 8 – Burner installed in appliance front

Legend

- **H** Housing total length *(CF1400 - 18”, CF2300 - 18.5”)*
- **J** Center to bottom of housing *(CF1400 - 10.88”, CF2300 - 10.5”)*
- **K** Overall housing height *(CF1400 - 13.63”, CF2300 - 15.63”)*



❑ Fuel unit by-pass plug

WARNING

Install Oil Supply To Specifications

Failure to properly install the oil supply system could cause oil leakage, equipment malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire

- Carefully install the oil supply lines, fittings and components using the guidelines provided in this section.
- The oil supply must comply with the latest edition of NFPA 31 (Canada CSA B139) and all applicable codes.
- Do NOT install valves in the return line.
- If the oil supply inlet pressure to the pump exceeds 3 psig or for gravity feed systems, install an oil safety or pressure reducing valve (Webster OSV, Suntec PRV or equivalent).

The burner is shipped with a by-pass plug installed in the fuel unit. For low/high operation, the by-pass plug must be left in the fuel unit, regardless of the fuel system used (one-pipe with by-pass loop or two-pipe). Do not remove the by-pass plug.

❑ One-pipe oil system by-pass loop

WARNING

Factory-Installed Pump Bypass Plug

Failure to follow these guidelines will cause the fuel pump seals to rupture and result in oil leakage, burner malfunction and potential fire and injury hazards.

- Models CF1400 and CF2300 are shipped with the pump bypass plug installed.
- Do not remove the bypass plug from the pump. It is required for step-firing (Lo/Hi) operation.
- Do not operate the burner unless a return line or bypass loop is installed or the pump seal will rupture.
- Carefully comply with the following instructions provided in this section of the manual.

Refer to ***Figure 9*** (item **m**). Note the addition of a field-installed by-pass loop (use 3/8" copper tubing) from the fuel unit Return port to the Inlet port. This line is required for low/high operation. It simulates the flow of a two-pipe system at the fuel unit.

❑ Oil supply/return lines

- Install the oil tank and oil lines in accordance with all applicable codes.
- Size the oil supply and return lines using the guidelines given in the fuel unit literature included in the literature envelope. Oil line flow rate will equal the burner rate for one-pipe systems. For two-pipe systems, refer to ***Table 3*** for the fuel unit gearset capacity - the rate at which fuel is recirculated when connected to a two-pipe system. Size two-pipe oil lines based on this flow rate.
- Use continuous lengths of heavy-wall copper tubing, routed under the floor where possible. Do not attach fuel lines to the appliance or to floor joists if possible. This reduces vibration and noise transmission problems.
- Install an oil filter sized to handle the fuel unit gearset flow capacity (***Table 3***) for two-pipe systems. However, size the filter for the firing rate for one-pipe systems. Locate the filter immediately adjacent to the burner fuel unit.
- Install two high-quality shutoff valves in accessible locations on the oil supply line. Locate one valve close to the tank. Locate the other valve close to the burner, upstream of the fuel filter.

❑ Burner fuel flow

One-pipe systems – See ***Figure 9*** for the fuel flow paths for high-fire and low-fire operation. The low-fire by-pass regulation is done internally for type **B** fuel units. Oil supply connects to one of the fuel unit Inlet ports.

Two-pipe systems – See ***Figure 10*** for the fuel flow paths for high-fire and low-fire operation. The low-fire by-pass regulation is done internally for type B fuel units. Oil supply connects to one of the fuel unit Inlet ports. Oil return connects to the fuel unit Return port.

Low-fire/high-fire operation – The fuel unit nozzle port pressure is factory set at 300 psig.

- At high fire, full pressure (300 psig) is applied at the oil nozzle, causing full input.
- At low fire, the by-passing is done inside the fuel unit when the by-pass valve operates.
- This by-passing of oil reduces the oil pressure at the nozzle (to between 125 psig and 175 psig), reducing the input.

Figure 9 – One-pipe oil flow with "B" pump

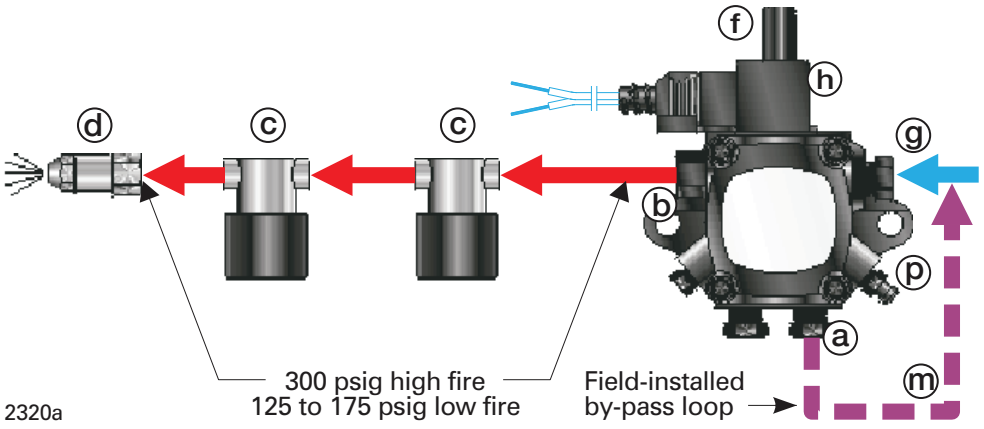
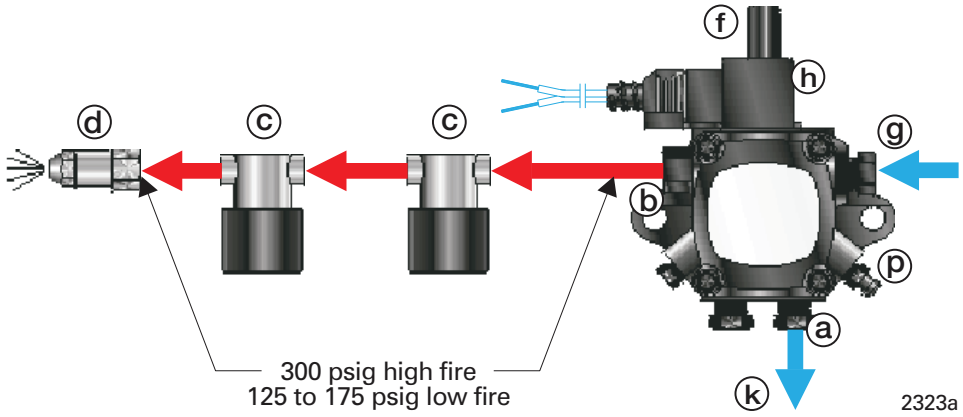


Figure 10 – Two-pipe oil flow with "B" pump



Legend (figure 9 & 10)

- **a** Return port
- **b** Nozzle port
- **c** Oil valves
- **d** Nozzle & adapter
- **f** By-pass pressure regulator
- **g** Inlet port
- **h** By-pass valve ("B" pump)
- **k** Return line to oil tank
- **m** One-pipe by-pass loop, 3/8"
- **p** Air bleed valve

Table 3 – Fuel unit gearset capacities

Model	Fuel Unit Model Number	Gearset Capacity (gph)
CF1400	B2TA-8245	21
CF2300	B2TA-8852	39

- **Nozzle pressure** – The fuel unit nozzle port pressure is factory set at 300 psig. Some original equipment manufacturer burner applications may call for a lower pressure to obtain a required firing rate. Do not change this pressure unless directed to do so by the appliance manufacturer.

Wire the burner — R7184B

WARNING **Electrical Shock Hazard**

Electrical shock can cause severe personal injury or death.

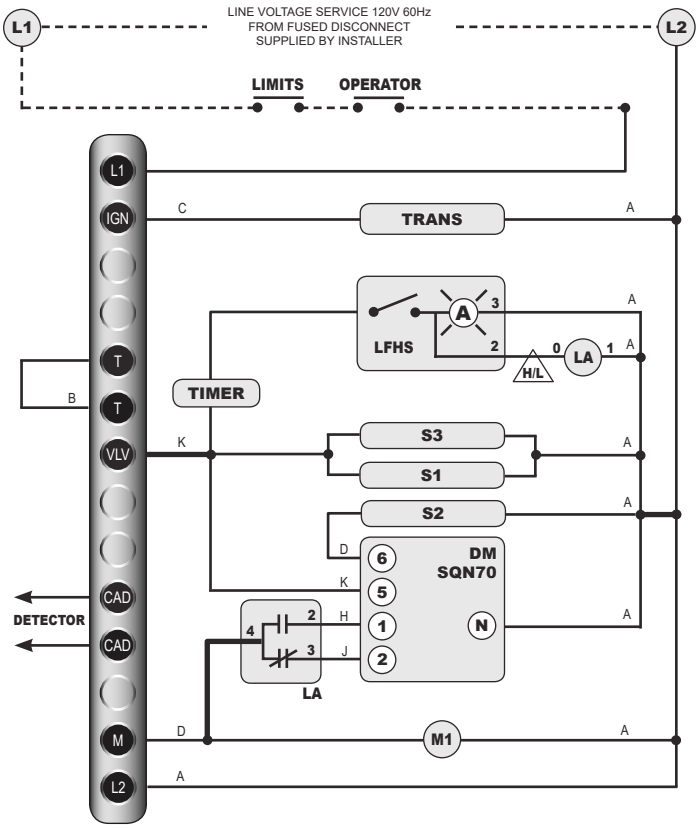
- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation)
- Perform all wiring in compliance with the National Electric Code ANSI/NFPA 70 (Canada CSA C22.1).

Install the burner and all wiring in accordance with the National Electrical Code and all applicable local codes or requirements.

Wire the burner in compliance with all instructions provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines.

See ***Figure 11*** for a typical wiring diagram, with R7184 oil primary, for reference purposes only.

Figure 11. - Typical wiring (R7184B)



Legend

CC	Flame sensor, cad cell typical
DM	Damper motor
FD	Fused Disconnect, by others
F-F	Cad cell flame sensor terminals
H/L	Low/high control wiring tag
LFHS	Low fire hold switch
LM	Limit controls, by others
M1	Burner motor
OP	Operating controls, by others
PR	Oil primary control, R7184 typ.
S2	High/low valve
S1, S3	On/off valve
TR	Ignition transformer
T-T	24-volt thermostat/limit terminals

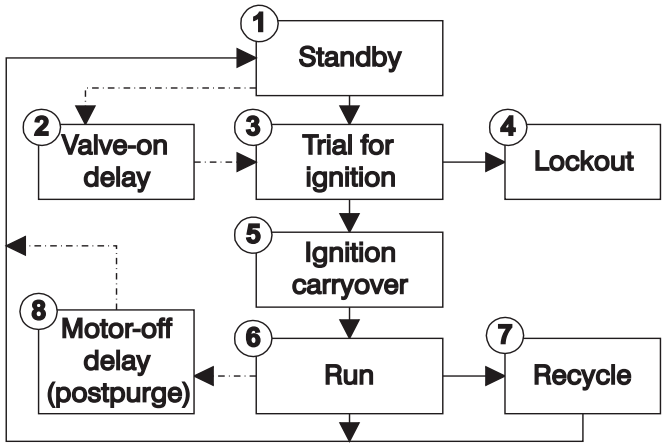
Sequence of operation — typical

Install the burner and all wiring in accordance with the National Electrical Code and all applicable local codes or requirements.

Wire the burner in compliance with all instructions provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines.

Sequence of operation — typical

1. **Standby** — The burner is idle, waiting for a call for heat. When a call for heat is initiated, there is a 3- to 10-second delay while the control performs a safe start check.
2. **Valve-on delay** — As applicable, the ignition and motor are turned on for a 15-second prepurge.
3. **Trial for ignition (TFI)** — The fuel valve is opened, as applicable. A flame should be established within the 15-second lockout time (30-second lockout time is available).
4. **Lockout** — If flame is not sensed by the end of the TFI, the control shuts down on safety lockout and must be manually reset. If the control locks out three times in a row, the control enters restricted lockout. Call a qualified service technician.
5. **Ignition carryover** — Once flame is established, the ignition remains on for 10 seconds to ensure flame stability. It then turns off.
6. **Run** — The burner runs until the call for heat is satisfied. The burner is then sent to burner motor-off delay, as applicable, or it is shut down and sent to standby.
7. **Recycle** — If the flame is lost while the burner is firing, the control shuts down the burner, enters a 60-second recycle delay, and then repeats the ignition steps outlined above. If the flame is lost three times in a row, the control locks out to prevent continuous cycling with repetitious flame loss caused by poor combustion.
8. **Burner motor-off delay** — If applicable, the fuel valve is closed and the burner motor is kept on for the selected postpurge time before the control returns the burner to standby.



Resetting to OHM

- If the control locks out three times in a row without a complete heat cycle between attemps, the lockout becomes restricd. A qualified service technician should be called to inspect the burner.

Prepare the burner for start-up

WARNING **Professional Installation and Service Required**

Incorrect installation and mishandling of start-up could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- This burner must be installed and prepared for start-up by a qualified service technician who is trained and experienced in commercial oil burner system installation and operation.
- Do not attempt to start the burner unless you are fully qualified.
- Do not continue with this procedure until all items in the "Prepare the burner for start-up" section have been verified.
- Carefully follow the wiring diagrams, control instruction sheets, flame safeguard sequence of operation, test procedures and all appliance manufacturer's directions that pertain to this installation.
- If any of these items are not clear or are unavailable, call Beckett at 1-800-645-2876 for assistance.

WARNING **Do Not Bypass Safety Controls**

Tampering with, or bypassing safety controls could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- Safety controls are designed and installed to provide protection.
- Do not tamper with, or bypass any safety control.
- If a safety control is not functioning properly, shut off all main electrical power and fuel supply to the burner and call a qualified service agency immediately.

CAUTION **Keep Service Access Covers Securely Installed**

These covers must be securely in place to prevent electrical shock, damage from external elements, and protect against injury from moving parts.

- All covers or service access plates must be in place at all times except during maintenance and service.
- This applies to all controls, panels, enclosures, switches, and guards or any component with a cover as part of its design.

Start-up checklist – Verify the following before attempting to start burner.

- ☐ Combustion air supply and venting have been inspected and verified to be free of obstructions and installed in accordance with all applicable codes.
- ☐ Oil nozzle has been selected correctly and securely installed in the nozzle adapter.
- ☐ Fuel unit by-pass plug ***has not*** been installed for one-pipe oil system.
- ☐ By-pass plug ***has been*** installed for two-pipe oil system.
- ☐ Fuel connection to nozzle line assembly is secure.
- ☐ Dimension Z has been set per this instruction manual.
- ☐ Fuel supply line is correctly installed, the oil tank is sufficiently filled, and shut-off valves are open.
- ☐ Burner is securely mounted in appliance, with pressure firing plate and gasket installed for pressurized chamber application.
- ☐ Appliance has been filled with water (boilers) and controls have been operationally checked.
- ☐ Burner has been installed in accordance with appliance manufacturer's instructions (when available).
- ☐ Also refer to appliance manufacturer's instructions (when available) for start-up procedures.

❑ Z dimension

Should be set per these instructions (see **page 10**). The top acorn nut (***Figure 12***, item **d**) should never be loosened once the Z dimension is initially set.

❑ Adjusting plate assembly (Figure 12)

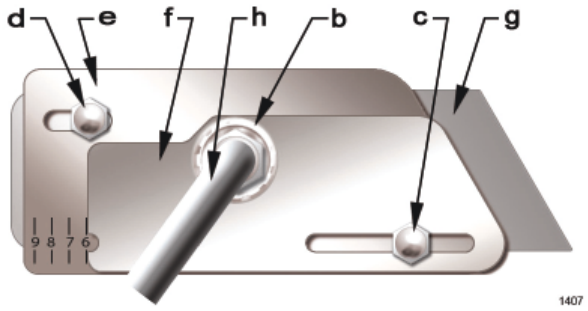
Make sure spline nut (item **b**) and bottom acorn nut (item **c**) are loose before proceeding to next section.

❑ Initial head position (Figure 12)

The indicator plate assembly (item **e**) markings correspond to head position settings.

- Slide the secondary adjusting plate (item **f**) toward the rear of the burner until the number on the indicator plate corresponds to the initial head setting given in ***Tables 4a*** and ***4b*** for the desired firing rate and burner (high-fire).
- ***Figure 12*** shows a typical example, with a head setting of 6.
- When the head position has been set, tighten the bottom acorn nut (item **c**) and the spline nut (item **b**).

Figure 12 – Adjusting plate initial setting, typical



Legend

- **b** Spline nut for securing nozzle line
- **c** Bottom acorn nut (for head adjustments)
- **d** Top acorn nut (for setting dim. Z only - do not loosen after setting Z)
- **e** Indicator adjusting plate
- **f** Secondary adjusting plate
- **g** Primary adjusting plate
- **h** Copper oil line from oil valve to nozzle line

Table 4a. CF1400 Initial indicator adjustment plate settings

	Tube	Head Position		Damper Position	
		Approximate Head Setting	Firing Rate (gph)	Approximate Air Damper Setting	Firing Rate (gph)
CF1400	A	0	4.00	0	--
		1	4.50	10	--
		2	5.00	20	4.00
		3	6.00	30	5.00
		4	7.00	40	7.00
		5	7.50	50	8.00
		6	8.00	60	10.00
		7	9.00	70	11.00
		8	9.50	80	--
		9	10.00	90	--
		10	11.00	100	--
		--	--	110	--
		--	--	120	--
	B	0	7.00	0	--
		1	7.50	10	--
		2	8.00	20	--
		3	9.00	30	--
		4	10.00	40	7.00
		5	10.50	50	8.00
		6	11.00	60	10.00
		7	12.00	70	11.00
		8	13.00	80	12.00
		9	13.25	90	12.50
		10	13.60	100	13.00
		--	--	110	13.25
		--	--	120	13.60

Table 4b. CF2300 Initial indicator adjustment plate settings

	Tube	Head Position		Damper Position	
		Approximate Head Setting	Firing Rate (gph)	Approximate Air Damper Setting	Firing Rate (gph)
CF2300	A	0	11.0	0	--
		1	12.0	10	7.0
		2	13.0	20	10.0
		3	14.0	30	13.0
		4	15.0	40	14.0
		5	16.0	50	15.0
		6	17.0	60	16.0
		7	18.0	70	17.0
		8	19.0	80	18.0
		9	20.0	90	19.0
		--	--	100	20.0
	B	0	12.5	0	--
		1	13.0	10	10.0
		2	14.0	20	13.0
		3	15.0	30	14.0
		4	16.0	40	15.0
		5	17.0	50	16.0
		6	18.0	60	17.0
		7	18.5	70	18.0
		8	19.0	80	18.5
		9	20.0	90	19.0
		--	--	100	20.0

❑ Initial air settings

The following steps outline the procedure for initially setting the damper. Refer to ***Figure 13*** and ***Tables 4a*** or ***4b*** for this procedure.

1. Remove the cover screw (**A**) then the cover (**B**) and place to one side.

2. Using the wrench (**C**) supplied with the damper motor, adjust the blue low fire cam (**D**) to the initial setting listed in ***Tables 4a*** or ***4b***.

3. Using the same wrench, adjust the red high fire cam (**H**) to the initial settings listed in ***Tables 4a*** or ***4b***.

4. Ensure the damper plate is in the correct position. The cam notch (**E**) should align with the low fire setting on the damper motor scale (**F**).

5. If the damper plate is not in the correct position, disengage the motor by pushing in on the motor pin (**G**), then rotating the damper plate until the cam notch and motor scale setting are aligned. Re-engage the pin.

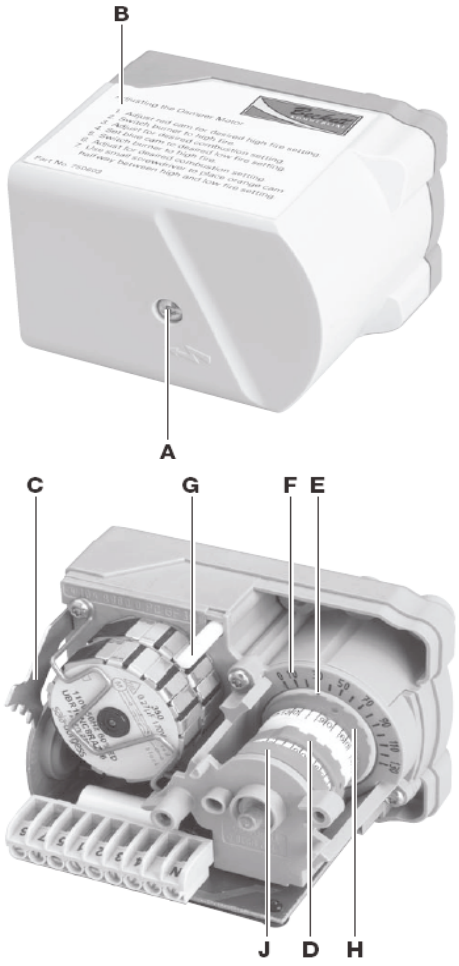
6. To adjust the high fire transition, use a small straight edge screw driver, turn the white adjustment screw, located in the orange transition cam, either clockwise or counterclockwise until the cam indicator is half way between the high and low settings on the scale.

    - Rotate the air adjusting plate until the lower edge of the pointer is opposite the number from ***Tables 4a*** or ***4b*** corresponding to the desired low fire rate.
    - This initial setting should be adequate for starting the burner at low fire. Once the burner is in operation, the air setting will be adjusted for best performance as discussed later in this manual.
    - Follow the procedures described later in this manual to fine tune the air settings.

NOTICE

The damper plate is attached by screws to its shaft, and bears against a flat on the shaft for alignment. The shaft is secured to the damper motor by a sleeve coupling with two setscrews bearing against the damper shaft and two more against the motor shaft. The motor shaft has a flat matching the one on the damper shaft. The flats on the damper shaft and the motor shaft should be aligned so that the position indicator in the damper motor reads accurately. The best way to align the flats is to tighten the setscrews that bear against the flats on the shafts first, and then tighten the ones that bear against the round surface of the shafts afterward.
The test for proper alignment is to disengage the damper motor from its shaft using the disengaging pin (Item **G** in ***Figure 13B***) and rotate the damper plate to its full closed position. The position indicator should point to 0° within + 5° tolerance.

Figure 13 - Damper Motor



Legend (figure 13)

A	Cover screw	**F**	Damper motor scale
B	Cover	**G**	Disengaging pin
C	Wrench	**H**	High fire cam (red)
D	Low fire cam (blue)	**J**	Transition cam (orange)
E	Cam notch		

❑ Set appliance limit controls

- Set the appliance limit controls in accordance with the appliance manufacturer's recommendations.
- Move the low-fire hold switch (not shown) to the low fire hold position. This will hold the burner in low fire during initial start-up.

❑ Prepare the fuel unit for air venting

- To vent air from one-pipe oil systems, attach a clear hose to the vent plug on the fuel unit. Provide a container to catch the oil. Loosen the vent plug.
- Vent the air as described under 'Start the Burner'.

Start the burner

WARNING **Explosion and Fire Hazard**

Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.

- Do not attempt to start the burner when excess oil has accumulated in the appliance, the appliance is full of vapor, or when the combustion chamber is very hot.
- Do not attempt to re-establish flame with the burner running if the flame becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

WARNING **Professional Service Required**

Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.

Please read and understand the manual supplied with this equipment. This equipment must be installed, adjusted and put into operation only by a qualified individual or service agency that is:

- Licensed or certified to install and provide technical service to oil heating systems.
- Experienced with all applicable codes, standards and ordinances.
- Responsible for the correct installation and commission of this equipment.
- Skilled in the adjustment of oil burners using combustion test instruments.

The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard for the installation of Oil-burning Equipment, NFPA 31 (or CSA B139 and B140 in Canada).

Regulation by these authorities take precedence over the general instructions provided in this installation manual.

Do not proceed unless all prior steps in this manual have been completed.

❑ Start burner and vent air from oil line

WARNING **Hot Gas Puff-back and Heavy Smoke Hazard**

Failure to bleed the pump properly could result in unstable combustion, hot gas puff-back and heavy smoke.

- Do not allow oil to intermittently spray into a hot combustion chamber while bleeding.
- Install a gauge in the nozzle discharge port tubing or fully open the pump bleed valve to prevent oil spray from accumulating in the combustion chamber when venting air from the fuel pump.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump air bleed valve.

❑ Disable function

- Any time the motor is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held and will return to standby when released.

❑ CAD cell resistance check

- While the burner is firing, and after the ignition has been turned off, press and release the reset button (hold 1/2 second or less) to check the cad cell resistance. The LED will flash 1 to 4 times, depending on the cad cell resistance (refer to the table below).

Number of LED flashes	Cad Cell Resistance (ohms)
1	Normal (0 to 400)
2	Normal (400 to 800)
3	Normal (800 to 1600)
4	Limited (1600-Lockout)*

** Lockout can occur above 4000 ohms.*

LED Indicator	Status
On	Flame sensed
Off	Flame not sensed
Flashing (1/2 sec off - 1/2 sec on)	Lockout/Restricted Lockout
Flashing (2 sec off - 2 sec on)	Recycle

❑ Operating the burner

1. Move the **low-fire hold** switch to the **low fire hold** position (to hold burner in low fire when started).
2. Verify that the air adjusting cam (***Figure 13b***, item **d**) has been set to the initial low-fire air setting as described under Initial air settings.
3. Open the oil shutoff valves in the oil supply (and return) line(s) to the burner.
4. Set the thermostat (or operating control) to call for heat.
5. Close the line switch to the burner. The burner motor should start immediately.
6. If the burner motor does not start, reset the motor overload switch (if so equipped) and press the reset switch of the burner primary control.
7. Vent the fuel unit as soon as the burner motor starts rotating. To vent —

   - Attach a clear plastic tube to the air bleed valve (***Figure 9 or 10*** **as applies, item p**).
   - Place the end of the tube in a container to catch the oil. Then loosen the fuel unit air vent valve.
   - Tighten the air vent valve after all air has been purged.
   - **IF burner stops during venting** —
     - The burner primary control will lockout if flame is not established within its time limit. This is typically 15 seconds for R7184B primary controls, but may be less for other flame supervisory controls.
     - The burner may lockout several times during the period needed to purge all the air. To extend air venting time, press the red reset button for 1/2 second during the prepurge cycle to continue purging.
   - **IF burner stops after flame established** —
     - Additional venting is probably required. Repeat the air venting procedure.
8. Once flame is steady, proceed to Set high-fire air.

❑ Set high-fire air

1. Allow the burner to run at **low fire** until the appliance has warmed sufficiently.
2. Visually check the flame. The flame should not be dark orange or smoky. If the flame appears to be smoking, increase the amount of air by readjusting the damper indicator to a higher number.
3. Once the appliance has warmed, the **high-fire** setting can be checked and adjusted.
4. Locate the approximate air adjusting plate setting for **high fire** in ***Table 4a*** **or** ***4b***.
5. Place the **low-fire hold** switch in the **high-fire position**. The damper motor will begin to rotate after four seconds.
6. Use combustion test instruments to adjust the burner.
   a. Adjust the air by moving the red cam to a lower number until a trace of smoke is achieved with CO_2 level as high as possible (lowest possible O_2). **Example**: 13.5% CO_2 (2.5% O_2) with a trace of smoke.
   b. Increase the air by increasing the red cam number to reduce CO_2 by 2 percentage points at a zero smoke level. (Increase O_2 by 3 percentage points at a zero smoke level.)
   Example: Reduce CO_2 from 13.5% to 11.5%, with zero smoke (or increase O_2 from 2.5% to 5.5%).
   c. A margin of reserve air has been added to accommodate variable conditions.
7. Check the breech draft pressure against the appliance manufacturer's recommended setting (typically + 0.1" W.C.).
8. If the breech pressure is higher or lower than recommended level, adjust the appliance breech damper to achieve the specified setting. Recheck the smoke and CO_2 levels. Adjust burner air if necessary.
9. Once all settings are complete and satisfactory, proceed to 'Set low-fire air'.

❑ Set low-fire air

1. Move the **low-fire hold** switch from the **"High Fire position"** to the **"Low Fire Hold"** position.
   a. The damper will return to the **low-fire** air setting.
2. Check the smoke and CO_2 (O_2) levels.
   a. Pull a smoke sample from the flue.
   b. The sample should be clean (zero smoke level).
   c. Check the CO_2 (O_2) level:
   CO_2 should be at 11 to 12% (O_2 at 5.9 to 4.5%).
   If the CO_2 is less than 11% (O_2 more than 5.9%), decrease the air and check the smoke level.
3. Operate the burner from **low fire** to **high fire** and back to verify operation.
4. Turn the burner off. Wait one or two minutes (for chamber to clear) and then turn on again to verify starting characteristics.
5. Perform limit circuit performance test specified by appliance manufacturer to verify operation of burner/appliance combination.

Maintenance and Service

WARNING **Annual Professional Service Required**

Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.

- Do not tamper with the burner or controls or make any adjustments unless you are a trained and qualified service technician.
- To ensure continued reliable operation, a qualified service technician must service this burner annually.
- More frequent service intervals may be required in dusty or adverse environments.
- Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

Annual Service

- ❒ Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- ❒ Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- ❒ Remove and clean the pump strainer if applicable.
- ❒ Replace the nozzle with the exact brand, pattern, gph, flow rate and spray angle.
- ❒ Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- ❒ Check electrode tip settings. Replace electrodes if tips are rounded.
- ❒ Inspect the igniter spring contacts.
- ❒ Clean the cad cell lens surface, if necessary.
- ❒ Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- ❒ Inspect the combustion head and air tube. Remove any carbon or foreign matter. Replace all damaged units with exact parts.
- ❒ Clean the blower wheel, air inlet, air guide, burner housing and static plate of any lint or foreign material.
- ❒ If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.
- ❒ Check motor current. The amp draw should not exceed the nameplate rating.
- ❒ Check all wiring for secure connections or insulation breaks.
- ❒ Check the pump pressure and cutoff function.
- ❒ Check primary control safety lockout timing.
- ❒ Check ignition system for proper operation.
- ❒ Inspect the vent system and chimney for soot accumulation or other restriction.
- ❒ Clean the appliance thoroughly according to the manufacturer's recommendations.
- ❒ Check the burner performance. Refer to the section "Set combustion with test instruments".
- ❒ It is good practice to make a record of the service performed and the combustion test results.

Monthly maintenance — by owner

- ❒ Observe combustion air openings and vent system for integrity. Openings must be clean and free of obstructions.
- ❒ Check oil lines and fittings to verify there are no leaks.
- ❒ Observe burner ignition and performance to verify smooth operation.
- ❒ Shut the system down if you observe abnormal or questionable operation. Call a qualified service agency for professional inspection and service.

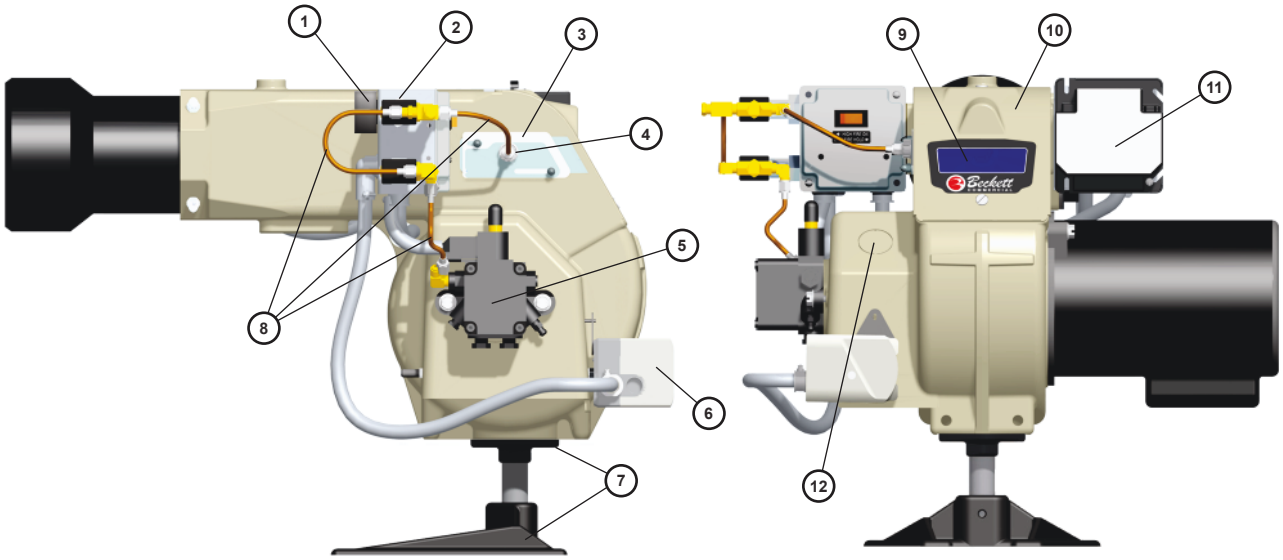
See next page for Beckett replacement parts ▶

Replacement Parts

For best performance specify genuine *Beckett* replacement parts

Item	Part Name	Description		Part No.
1	Timer	Nozzle valve delay		21295U
2	Oil Valve	Box mounted		21789U
3	Knurled Nut	All models		3666
4	Adjusting plate assembly	w/ cast aluminum door w/ stamped sheet-metal door		5994U 5201701U
5	Fuel pump	B2TA-8245 H3PAN-C150H		21313U 21309U
6	Damper motor	2-stage		750601U
7	Pedestal kit	All models		51193
8	Fuel lines	Specify length		-
9	Sight glass	All models		31346
10	Rear cover door assembly	w/ cast aluminum door* w/ stamped sheet-metal door*	CF1400 CF2300 CF1400 CF2300	5994U 51204U 5201301U 5201302U
11	Control	Specify		-
12	Coupling hole plug Coupling access door	use with threaded hole use with rectangular opening		32439U 16703GY
13	Head assembly	CF1400 CF2300		5978 51203
14	Electrode assembly	All models		51212
15	Ignition leads	8-1/4” long 11-3/4” long 15-1/4” long 19-1/4” long		5990082 5990116 5990152 5990192
16	Nozzle line assembly	Refer to ***Figure 5, Page 9***		
17	Air tube	Refer to ***Figure 4, Page 8***		
18	Transformer	12,000 volt		51214
19	Coupling	B pump H pump		21290 21308
20	Blower wheel	CF1400 - 5.59” x 3.09” CF2300 - 6.75” x 3.13”		21268U 21267U
21	Motor	120/208-230 single phase 208-230/460 three phase	CF1400 CF2300 CF1400 CF2300	21401U 21402U 21638U 21499U
	Motor relay (not shown)	120V single phase 208V single phase three phase		7273 7300 2194301
	Adjustable flange	see ***Figure 15*** on opposite page		

Figure 14 – Burner Replacement Parts



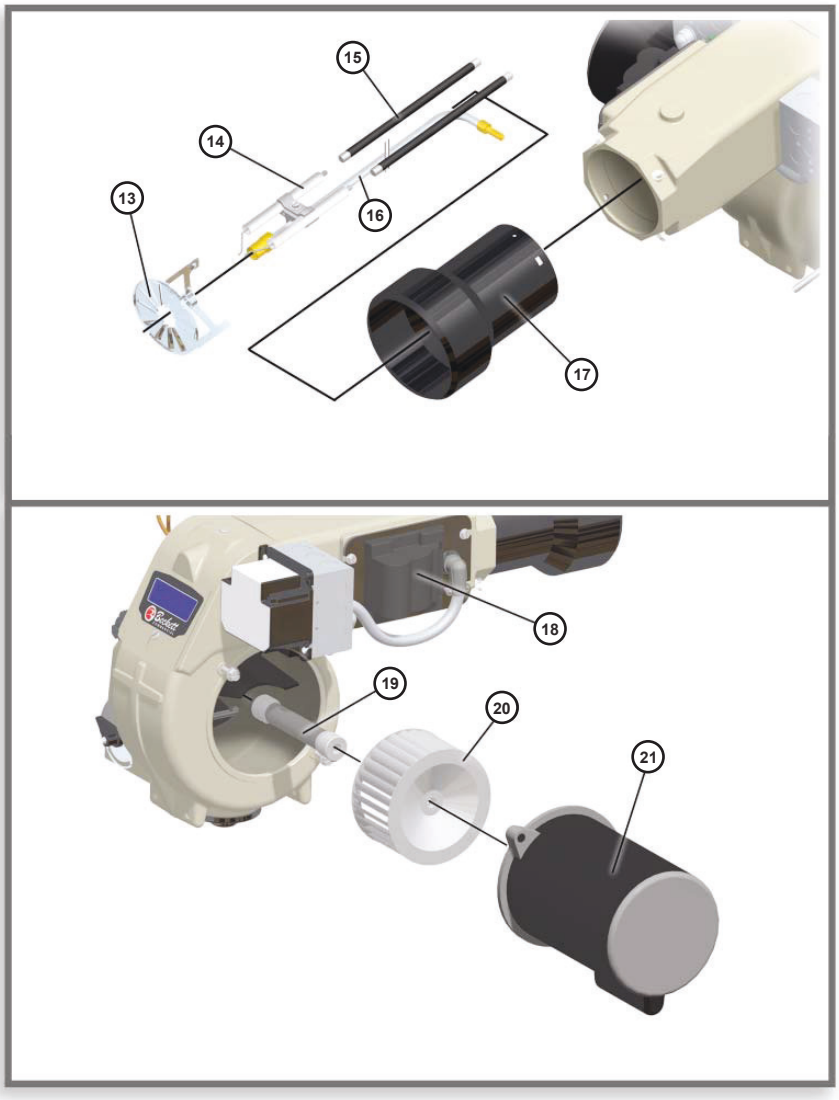
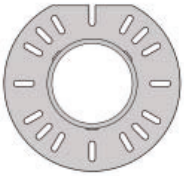
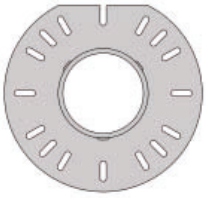


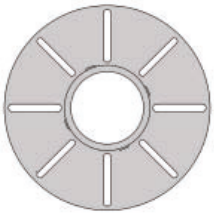
Figure 15 – Adjustable mounting plates



Flange A



Flange B



Flange C

Model	Flange **A**	Flange **B**	Flange **C**
CF1400	51312 (10.00" DIA.)	n/a	51629 (12.25" DIA.)
CF2300	51313 (12.44" DIA.)	51498 (13.92" DIA.)	51630 (16.00" DIA.)

Limited Warranty Information

Limited
WARRANTY
For Residential, Commercial and Specialty Burners

The R. W. BECKETT CORPORATION ("Beckett") warrants to persons who purchase its Beckett burners from Beckett for resale or for incorporation into a product for resale ("Customers") that its equipment is free from defects in material and workmanship under normal use and service for 60 months from the date of manufacture for Residential Burners and 18 months from the date of manufacture for Commercial and Specialty Burners. *Residential burner models include:* AF, AFG, AFII, NX, SF, SR and SMG. *Commercial burner models include:* CF375, CF500, CF800, CF1400, CF2300A, CF2500, CF3500A, CG10, CG15, CG25 and CG50. *Specialty burner models include:* ADC, ADCP, ARV, SDC and SM. The provisions of this warranty are extended to individual major burner components as follows:

a) 60 months from date of manufacture for all Beckett-branded major components, except for 12 Vdc components.
b) 18 months from date of manufacture for all non-Beckett-branded major components and Beckett branded 12 Vdc components.

Note: Normal service items found to be defective upon receipt by the customer are covered by this warranty.

THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT SUBJECTED TO MISUSE, NEGLECT, OR ACCIDENT: NOR DOES THIS WARRANTY APPLY UNLESS THE PRODUCT COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND LOCAL CODES REQUIRE, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS, IN ACCORDANCE WITH THE LATEST EDITION OF NFPA NO. 31 OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE LATEST EDITION OF THE NATIONAL FUEL GAS CODE (NFPA NO. 54) AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND NATIONAL CODES HAVING JURISDICTIONAL AUTHORITY.

Equipment, which is defective in material or workmanship and within the warranty period, may be returned for credit as follows:
Beckett Burners, Beckett-branded major components and non-Beckett-branded major components that came as original equipment on a Beckett burner or were sold as a replacement part by Beckett should be returned, freight prepaid, to Beckett's home office. Credit will be issued to the customer unless the returned equipment is determined by Beckett to be out of warranty or damaged by user, in which case the equipment will be scrapped.
Note: Beckett is not responsible for any labor cost for removal and replacement of equipment.

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes nor authorizes any person to assume for Beckett any other liability or obligation in connection with the sale of this equipment, Beckett's liability and Customer's exclusive remedy being limited to credit as set forth above.

R.W. BECKETT CORPORATION
P.O. Box 1289 Elyria, Ohio 44036
Form No. 61545 R72905

The Oilheat Manufacturers' Association supports the use of low sulfur fuels as defined by ASTM D396, Grades No. 1 Low Sulfur and No. 2 Low Sulfur, as the preferred heating fuel for the following reasons:
• Low sulfur fuels reduce deposits on heat exchanger surfaces, extending the service interval between cleanings.
• The reduced deposits increase the efficiency of the appliance.
• Low sulfur fuels reduce particulate emissions.
• Low sulfur fuels reduce oxides of nitrogen emissions.

R.W. BECKETT CORPORATION
U.S.A.: P.O. Box 1289 · Elyria, Ohio 44036
www.beckettcorp.com
Canada: R.W. Beckett Canada, Ltd. · Unit #3, 430 Laird Road · Guelph, Ontario N1G 3X7

INSTALLATION INFORMATION

SUNTEC industries incorporated

MODEL A SINGLE STAGE TWO-STEP
MODEL B TWO-STAGE TWO-STEP FUEL UNITS AND
MODEL B TWO-STAGE HIGH PRESSURE FUEL UNITS

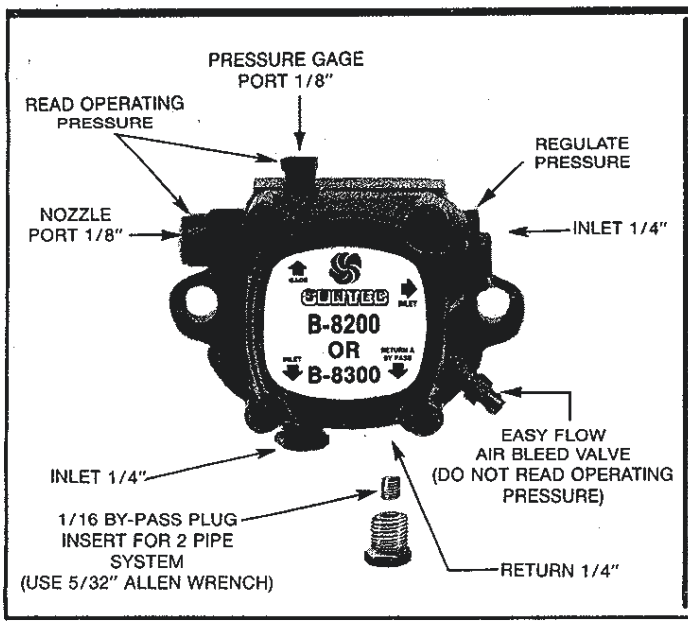


FIGURE 1

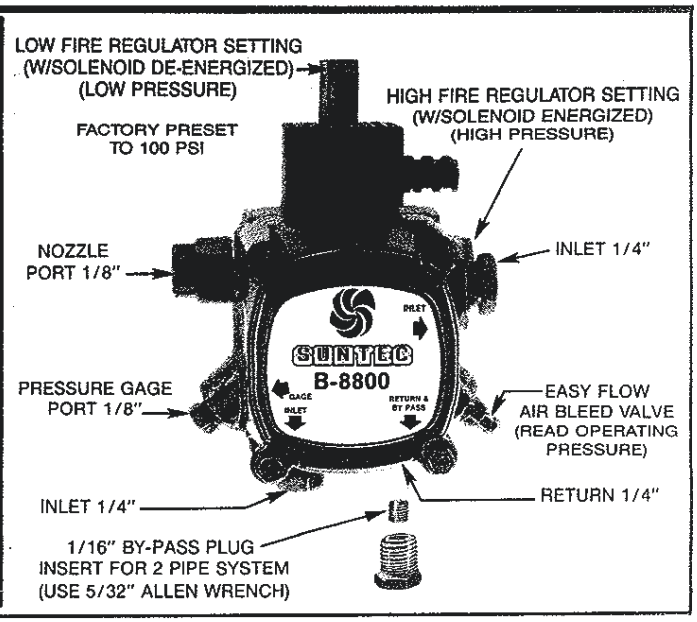


FIGURE 2

ONE-PIPE SYSTEM • FIGURE 3

DO NOT INSTALL BYPASS PLUG! Connect inlet line to pump inlet. Start burner. Arrange primary burner control for continuous operation during purging. Open easy flow bleed valve 1 turn CCW. Bleed unit until all air bubbles disappear — HURRIED BLEEDING WILL IMPAIR EFFICIENT OPERATION OF UNIT. Tighten easy flow bleed valve securely.

TWO-PIPE SYSTEM • FIGURE 4

REMOVE 1/16" BY-PASS PLUG FROM PLASTIC BAG ATTACHED TO UNIT. Remove 1/4" plug from return port. Insert by-pass plug (See Figure 1 or 2), tighten plug. Attach return and inlet lines. Start burner — Air bleeding is automatic. Opening Easy Flow Air Bleed Valve will allow a faster bleed if desired. Return line must terminate 3-4" above supply line inlet. (See Figure 4). Failure to do this may introduce air into the system and could result in loss of prime.

TWO STEP PUMPS • FIGURE 2

MODEL SHOWN IS RIGHT HAND ROTATION; ALL PORTS ARE REVERSED FOR LEFT HAND ROTATION.

SOLENOID WIRING Refer to burner manufacturer's manual for instructions.

NOTE: Wiring of the solenoid in parallel with the safety control circuit will bypass the low fire regulator.

REGULATOR SETTING Install pressure gage in gage port (remove after adjustment) with proper nozzle in nozzle line

- Low Fire — Factory preset to 100 PSI with rated nozzle.
- High Fire — With solenoid energized adjust high fire regulator to desired pressure. (Range 200 to 300 PSI)

NOTE: EXTERNAL CUTOFF VALVE (120V MAXIMUM) IS REQUIRED.

GENERAL INFORMATION • ALL SYSTEMS

IMPORTANT INFORMATION Long or oversized inlet lines may require the pump to operate dry during initial bleeding period. In such cases, the priming may be assisted by injecting fuel oil into the pump gearset. Under lift conditions, oil lines and fittings must be air tight. To assure this, "Pipe Dope" may be applied to both the used and unused inlet and both return fittings. DO NOT USE TEFLON TAPE!! DO NOT USE COMPRESSION FITTINGS!!

MOUNTING POSITION Model "A" Single Stage Fuel Unit may be mounted in any position. Model "B" Two Stage Fuel Unit may be mounted in any position except upside down (1/8" ports pointed down).

VACUUM CHECK A Vacuum Gage may be installed in either of the 1/4" inlet ports or in the 1/8" return port (on single pipe installations), whichever is most convenient. The Model "A" pump should be used where the vacuum does not exceed 6" hg. single pipe and 12" hg. two pipe. The Model "B" should be used where vacuum does not exceed 17" hg. Running vacuum is the total of all pressure drops (ΔP) from the tank to the inlet of the pump.

CAUTION

Pressurized or gravity feed installations must not exceed 10 P.S.I. on inlet line or return line at the pump. A pressure greater than 10 P.S.I. may cause damage to the shaft seal.

ONE-PIPE SYSTEM • MODEL A

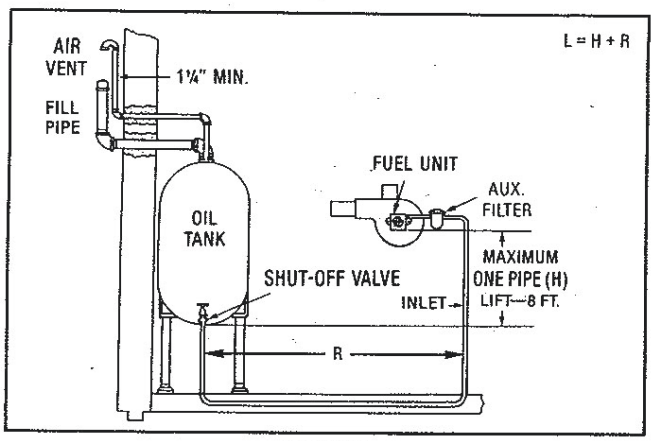


FIGURE 3

The SUNTEC MODEL "A"-70 FUEL UNIT may be installed ONE-PIPE with Gravity Feed or Lift.

The maximum allowable lift is 8 ft. — See Figure 3.

IMPORTANT: One-pipe installations must be absolutely air tight or leaks or loss of prime may result. Bleed line and fuel unit completely. **Bleed for 15 seconds after last air is seen from easy flow to be certain lines are air free.**

L = Line Length in Feet H = Head in Feet Q = Firing Rate in GPH

3/8" line $L = \frac{6 - .75H}{.0086\ Q}$ 1/2" line $L = \frac{6 - .75H}{.00218\ Q}$

If tank is above pump change - to +. Fittings, valves, and filters will reduce total length allowed.

TWO-PIPE SYSTEM • MODEL A AND B

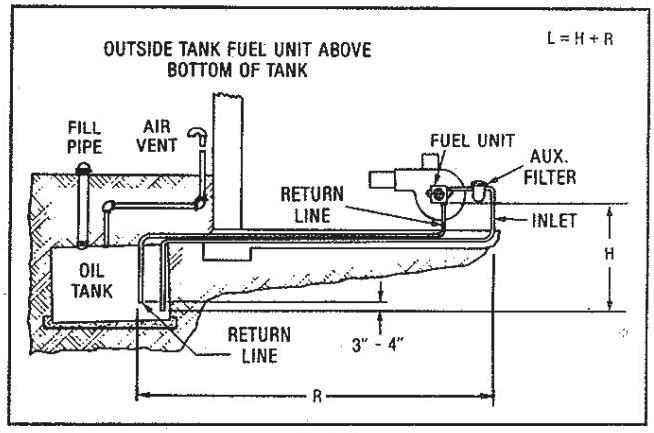


FIGURE 4

Always terminate return line as shown in Figure 4. Line lengths include both vertical and horizontal lengths.

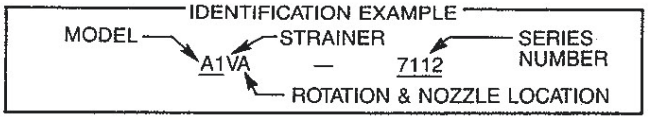
MODEL A SINGLE-STAGE TWO-STEP • TWO-PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H" Figure 4	3450 RPM					
	3/8" OD Tubing		1/2" OD Tubing			5/8" OD Tubing
	10 GPH	15 GPH	10 GPH	16 GPH	23 GPH	23 GPH
0'	33'	29'	100'	100'	72'	100'
1'	31'	27'	100'	100'	66'	100'
2'	28'	25'	100'	98'	59'	100'
3'	25'	23'	100'	89'	53'	100'
4'	23'	20'	92'	80'	46'	100'
5'	21'	18'	82'	72'	40'	100'
6'	18'	16'	72'	63'	34'	100'
7'	16'	14'	62'	55'	27'	88'
8'	13'	12'	52'	46'	20'	72'
9'	11'	9'	43'	37'	14'	56'
10'	—	—	33'	29'	8'	39'

MODEL B TWO-STAGE TWO-STEP AND TWO-STAGE HIGH-PRESSURE • TWO-PIPE MAXIMUM LINE LENGTH (H + R)

Lift "H" Figure 4	3450 RPM					
	3/8" OD Tubing		1/2" OD Tubing			5/8" OD Tubing
	10 GPH	16 GPH	10 GPH	16 GPH	23 GPH	23 GPH
0'	70'	60'	100'	100'	100'	100'
2'	64'	55'	100'	100'	100'	100'
4'	58'	50'	100'	100'	100'	100'
6'	52'	44'	100'	100'	100'	100'
8'	45'	39'	100'	100'	100'	100'
10'	39'	34'	100'	100'	100'	100'
12'	33'	28'	100'	100'	94'	100'
14'	27'	23'	100'	91'	76'	100'
16'	21'	18'	81'	70'	59'	100'
18'	—	—	57'	49'	41'	100'

PUMP USAGE IDENTIFICATION



STRAINER TYPE	UL Strainer Rating (GPH)* #2 Fuel Oil
V	3
Y	7
T	23
G	34

*Max. firing rate not to exceed max. nozzle capacity or strainer rating whichever is LESS. A greater firing rate requires a suitable external strainer.

ALL INSTALLATIONS SHOULD BE MADE WTH LOCAL AND NATIONAL CODES.

SUNTEC® industries incorporated

GLASGOW, KY 42142-5000

... working harder to serve you even better.

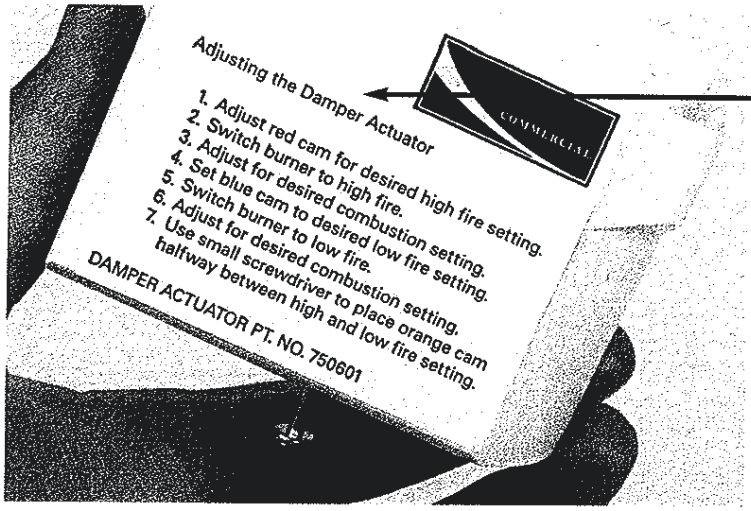
Form No. 2130
December 1995

Beckett

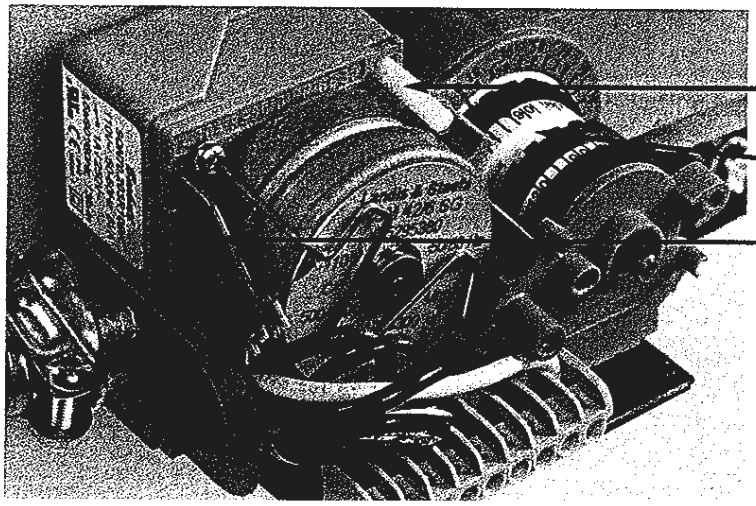
Damper Actuator

For Commercial Two-Stage Burners

Adjustment Instructions



Adjustment Instructions Printed on Cover



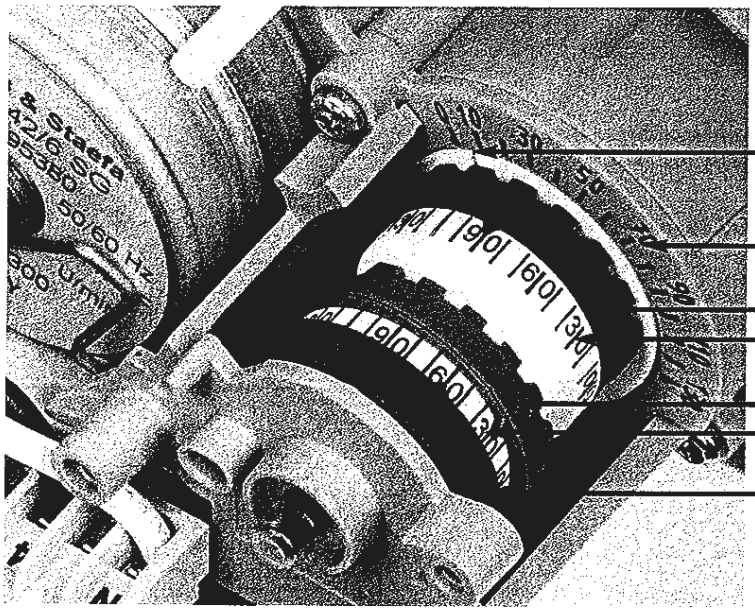
Disengaging Pin in the Engaged (out) Position

Cam Stack

Adjustment Wrench

The **Disengaging Pin** allows the Damper and Cam Stack to be rotated by hand.

The **Disengaging Pin** *must be in the engaged position (out) when the burner is operating.*



Damper Position Indicator (Notch in White Ring)

Damper Position Scale

Red High Fire Cam with White Adjustment Scale

Blue Low Fire Cam with White Adjustment Scale

Transition Cam shares Adjustment Scale

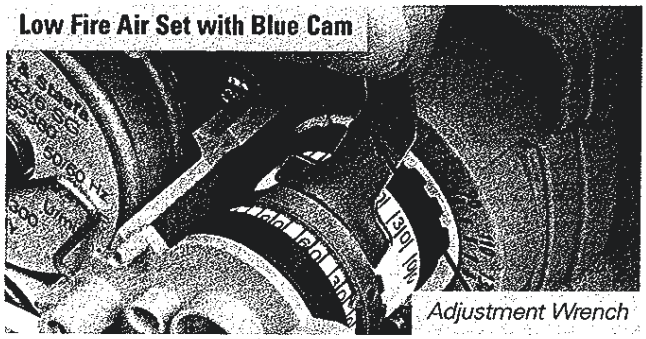
Beckett

Damper Actuator

For Commercial Two-Stage Burners
Adjustment Instructions

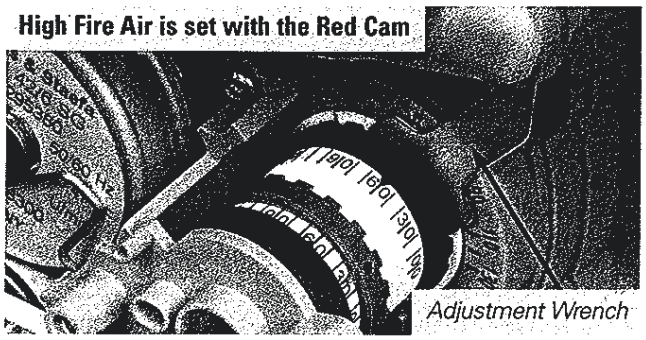
Setting the High Fire Air and Low Fire Air

Low Fire Air Set with Blue Cam



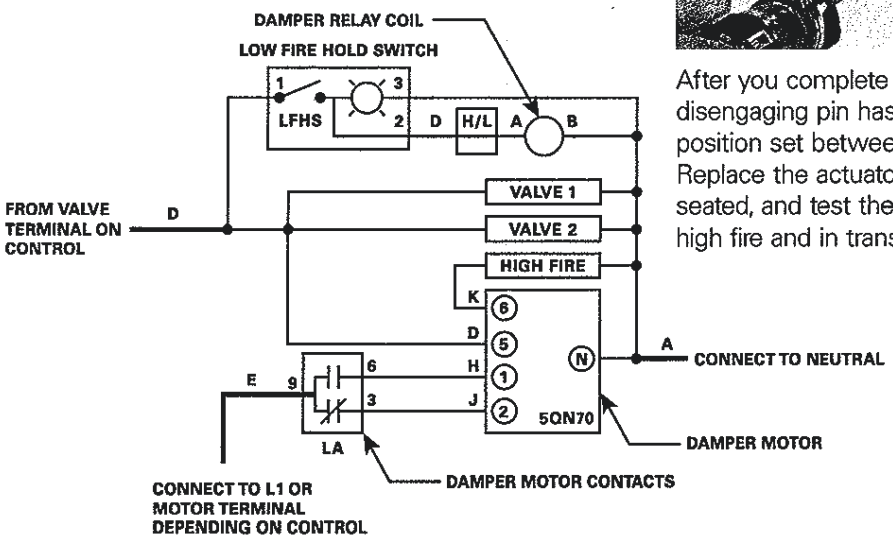
Adjustment Wrench

High Fire Air is set with the Red Cam



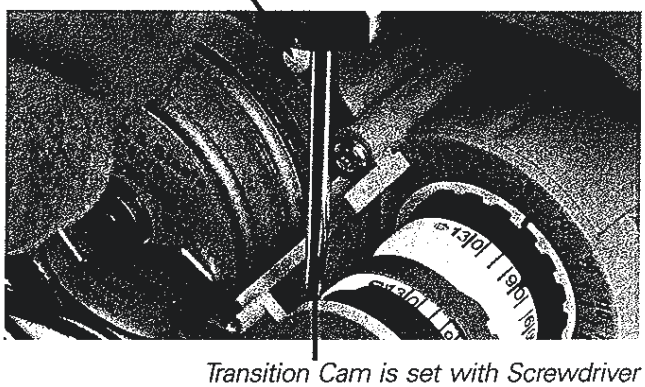
Adjustment Wrench

An old air setting specification of 7 is equal to 70° on the damper position scale of this new damper actuator.
If adjusting the air settings while the burner is operating, it is necessary to cycle the burner from High to Low Fire or Low to High by using the lighted low fire hold switch.



Setting the Transition

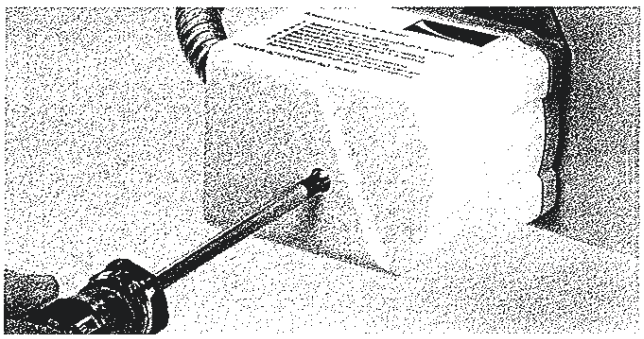
Cam is disengaged



Transition Cam is set with Screwdriver

The **ORANGE CAM** sets the transition point between Low Fire Oil and High Fire Oil.

It should be set halfway between the settings of the RED Cam and the BLUE Cam.



After you complete your adjustments make certain the disengaging pin has been reengaged with the damper position set between the high fire and low fire limits. Replace the actuator cover, making sure it is correctly seated, and test the burner for proper firing at low fire, high fire and in transition between low and high.

For more information, contact: **www.beckettcorp.com**

R.W. Beckett Corporation • P.O. Box 1289 • Elyria, Ohio 44036 • (800) 645-2876 • (440) 327-1060 • FAX (440) 327-1064
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Form No. 61578 09/04
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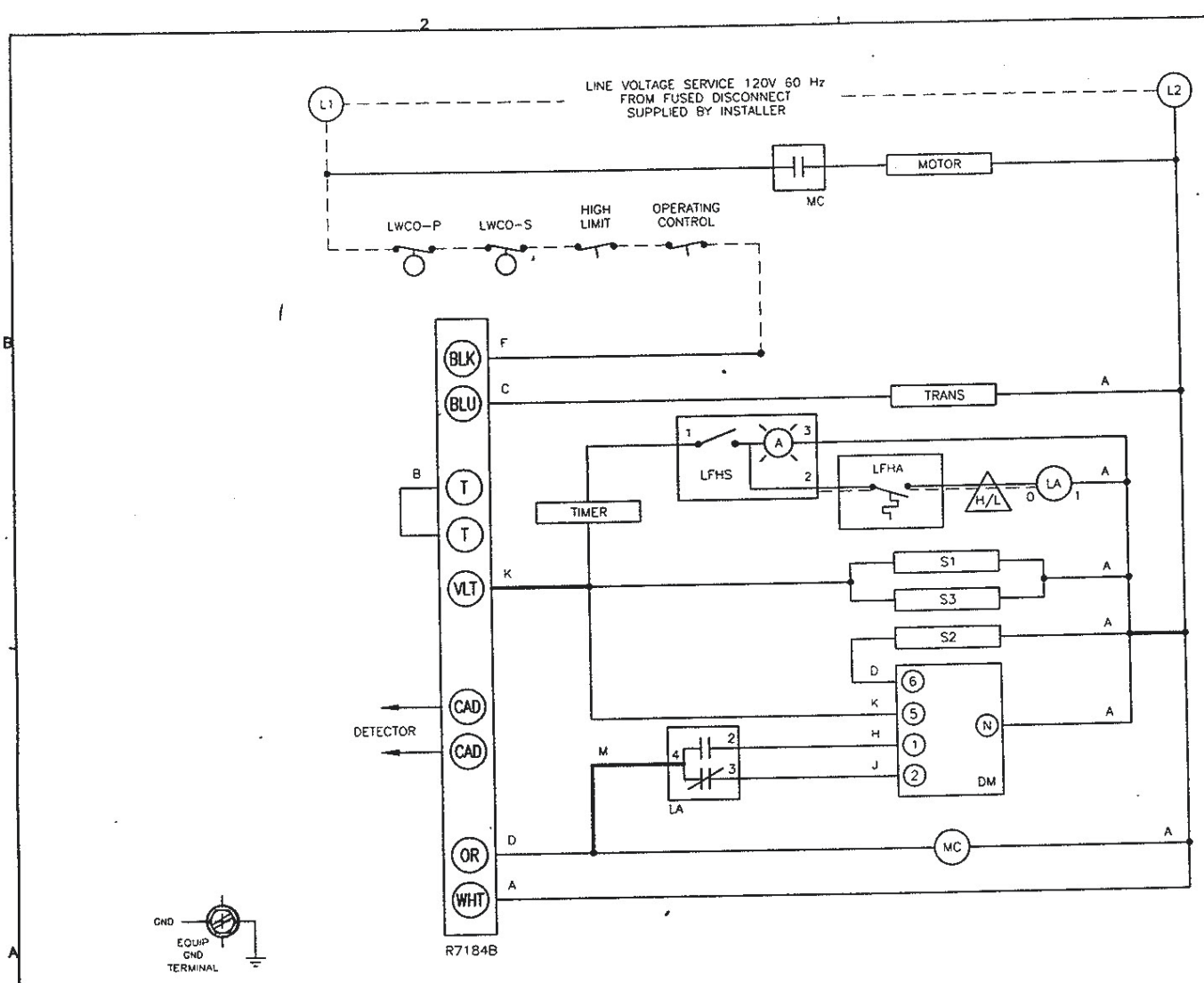
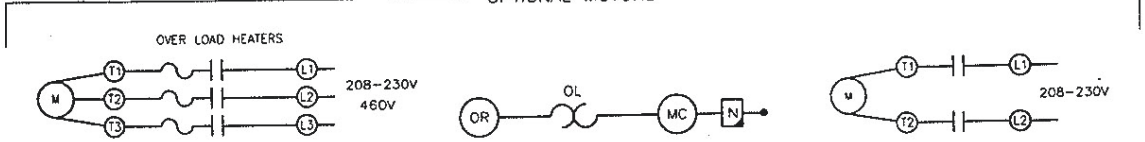




KEY

DM = DAMPER MOTOR
H/L = LO/HI CONTROL WIRING TAG
LA = LOW FIRE AIR RELAY
LFHA = LOW FIRE HOLD AQUASTAT
LFHS = LOW FIRE HOLD SWITCH
LWCO-P = LOW WATER CUTOFF - PRIMARY
LWCO-S = LOW WATER CUTOFF - SECONDARY (IF USED)
M = MOTOR
MC = MOTOR CONTACTOR
S1, S3 = ON/OFF VALVE
S2 = HIGH/LOW VALVE
TRANS = IGNITION TRANSFORMER

LEGEND

= CONTACT/DAMPER COIL
= LIGHT
= WIRING SUPPLIED BY INSTALLER
= CROSSOVER WIRES
= FACTORY JUMPER, TO BE CUT FOR FIELD WIRING TIE-IN

WIRE COLOR

A - WHITE
B - BLACK
C - BLUE
D - ORANGE
E - BROWN/RED
F - RED
G - BROWN
H - RED/WHITE
J - BLUE/WHITE
K - VIOLET
L - BLACK/RED
M - BLACK/WHITE
P - GREEN

MOTOR WIRE - 14GA.
ALL OTHER WIRE - 16 GA.

UNSPECIFIED WIRE COLORS BASED ON COMPONENTS

LIGHT COLOR

R = RED
G = GREEN
A = AMBER

NOTES

1. LOCATE HIGH/LOW OPERATOR BETWEEN DAMPER MOTOR AND LFHS.

DESCRIPTION				
CF1400 / CF2300 LOW/HIGH/OFF R7184B CONTROL			Beckett COMMERCIAL	
DRAWN/REV. BY: TB	CHECKED BY: RM	DRAWN/REV. DATE: 12/07/06	REVISION: 1	SCHEMATIC NO.: 6998004
LAST CHANGE: ADDED OPTIONAL AQUASTAT				

OPERATING INSTRUCTIONS & PARTS MANUAL

HIGH PRESSURE DIRECT-DRIVE BLOWERS

MODELS 2C940, 2C820, 4C108, 4C329 AND 4C330

FORM 5S2052
06820
0390/073/5M

READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

Description

Dayton direct-drive high pressure blowers are used for small exhaust systems where air is laden with dust or where dust-collection bags are necessary. Applications include handling long stringy material, paper trim, fiberous material such as textile scrap, wool and ensilage. Not suitable for coarse material. Heavy or abrasive dust. Dynamically balanced self-cleaning cast aluminum wheels. 16 GA housing and motor base. Maximum operating temperature 180°F (82°C). Finished in baked-on gray enamel. Blower can be assembled for CW or CCW rotation and any one of eight standard discharge positions. See Figure 2. Dayton motors packed separately when blowers are ordered complete.

General Safety Information

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Blower must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system by using a separate ground wire connected to the bare metal of blower frame, or other suitable means.
3. Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.
4. Be careful when touching the exterior of an operating motor — it may be hot enough to be painful or cause injury. With modern motors this condition is normal when operated at rated load and voltage — modern motors are built to operate at higher temperatures.
5. Protect the power cable from coming in contact with sharp objects.
6. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
7. Make certain that the power source conforms to the requirements of your equipment.
8. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.
9. Not recommended as an explosion proof blower. Do not use where explosive fumes or gases are present.
10. If blower is operated without an inlet or outlet duct, guard openings in accordance with OSHA regulations to prevent contact with rotating blower wheel.

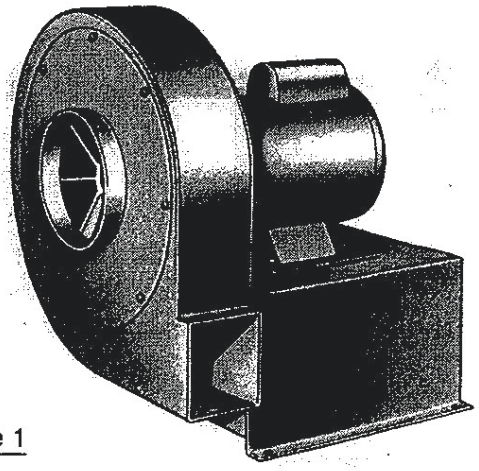


Figure 1

⚠ WARNING ⚠

KEEP HANDS AWAY FROM INLET WHILE BLOWER IS IN OPERATION.

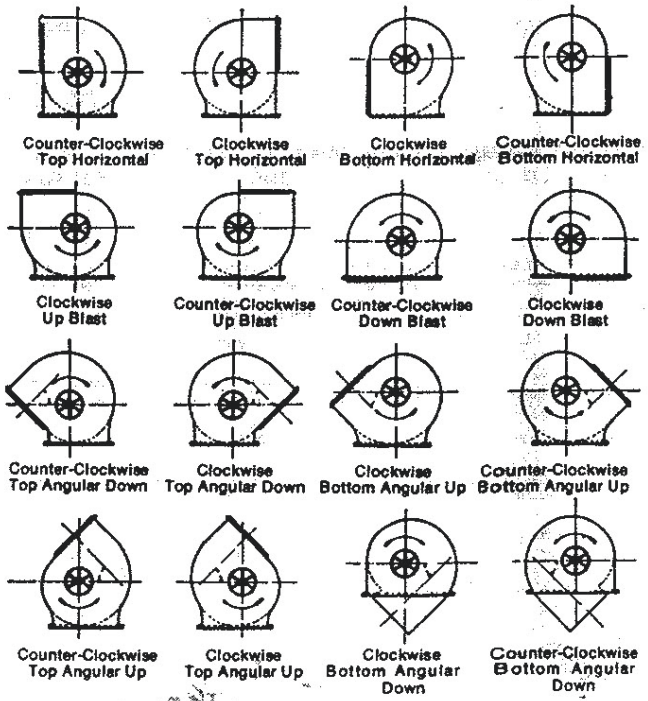


Figure 2

Specifications

MODEL	WHEEL DIA.	WHEEL W	WHEEL BORE	HIGH-PRESSURE BLOWER DIMENSIONS A	B	C	D	E	F	G	H	J	K	L	O	P	R	S	V	X ADJ. MIN.	X ADJ. MAX.
2C940	7¾"	2⁵⁄₁₆"	½"	11"	8"	3"	3"	5"	7"	½"	5⅜"	4⅞"	5⅞"	5⅞"	12¼"	4"	6⅝"	5½"	—	8¼"	9¾"
2C820	9	2¹³⁄₁₆	½	12⅛	8	3½	3½	5⅝	7	½	6⅜	5¾	6⅞	6¾	12¾	5	7½	6⅜	—	9⅛	10⅝
4C108	10⁹⁄₁₆	3	⅝	14¾	9	4	3½	6⅞	7½	¾	7¼	6½	8	7⅝	14	6	8⅝	8¼	—	11⅜	12⅞
4C329	12½	3	⅞	17	11¼	5	4	8	9¾	¾	8¼	7½	9	9⅝	17	7	10	7⅛	—	10⅝	10⅝
4C330	13½	4⅜	1⅛	17½	11¼	7⅛	5¾	8	9½	1	10½	9⅝	11⅜	11	18⅞	8	11½	8⅛	7¼	12⅝	12⅝

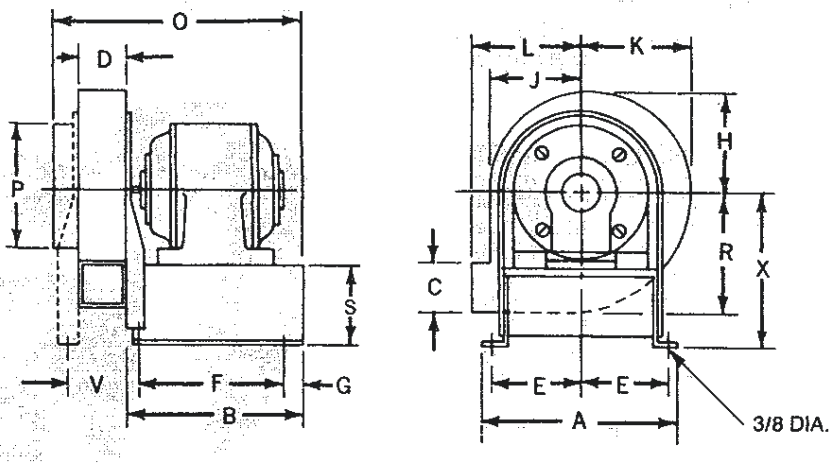


Figure 3

Performance

MODEL	HP REQ'D.	MOTOR FRAME	VOLTS	MOTOR TYPE	CFM AIR DELIVERY AT 3450 RPM 1" SP	2" SP	3" SP	4" SP	5" SP	6" SP	7" SP	8" SP	SHPG. WT.
2C940	1/3	48	115	Split	290	230	160	—	—	—	—	—	13
2C820	1/3	48	115	Split	530	470	415	335	165	—	—	—	17
4C108	1	56	115/230	Cap. (†)	800	745	680	610	510	375	225	—	25
4C329	3	145T	230/460	3-Ph.	1200	1140	1070	1010	940	870	790	695	37
4C330	5	182T	230/460	3-Ph.	2140	2030	1930	1820	1710	1615	1500	1375	64

(†) Also available in 208-230/460, 60Hz, 3-Phase.

Based on standard test codes of (AMCA) Air Moving and Conditioning Association

⚠ CAUTION

Must not be used where static pressure is less than shown in table. Severe motor overload will result. Motor overload protection, closely matched to motor full-load current, is highly recommended.

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. High pressure direct drive blowers, Models 2C940, 2C820, 4C108, 4C329, & 4C330, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specified legal rights which vary from state to state.

LIMITATION OF LIABILITY. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of the Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648

Assembly

1. Attach base upright to the motor mounting base as shown in the exploded view. Hand tighten (4) 1/4-20 x 1/2" bolts, washers, and nuts through slotted holes in base upright. Place motor on motor base and align the center hole of the base upright with the motor shaft. Secure the four 1/4-20 bolts. Models 4C329 and 4C330 have a welded motor base assembly.

2. Bolt the housing to the base upright in the desired discharge position using #10 x 3/8 or 5/16-18 x 3/4" self tapping bolts. Blower is clockwise rotation. Refer to exploded view showing clockwise bottom horizontal discharge.

3. With the motor shaft through the center hole of the base upright, align the mounting holes of the motor to the pre-drilled holes in the motor base. Install two bolts to retain proper motor alignment but do not tighten. Mount the wheel to the motor shaft. Refer to exploded view drawing.

4. Mount the inlet ring to the housing and secure with #10 x 3/8" or 5/16-18 x 3/4" self tapping bolts.

5. Slide the wheel toward the inlet ring so there is at least 1/4" clearance between the wheel and cone. The motor shaft should extend through the hub of the wheel so when the setscrews are securely tightened, they will make contact with the motor shafts.

6. Install the remaining nuts, bolts, and washers (not provided) to the motor mounting holes of the motor and secure to the blower motor base.

Installation

1. Make sure all bolts and screws are tightened before mounting on a rigid, flat, level foundation. Bolt the blower securely into position.

2. Check the interior of the fan housing to be sure it is free of debris. Rotate the wheel to insure that it is not rubbing or binding. Check the clearance of the wheel and the inlet ring. If rubbing exists, loosen the bolts on the ring and shift the ring until clearance is obtained. If still rubbing, loosen the set screw on the wheel and shift the wheel rearward to obtain clearance. Retighten the set screw.

Operation

1. Before connecting the motor to the electric supply, check the electrical characteristics as indicated on the motor nameplate to insure proper voltage and phase.

⚠ CAUTION

A ground wire must run from the blower motor housing to a suitable electrical ground such as a properly grounded metallic raceway or a ground wire system.

2. After electrical connections are completed, apply just enough power to start the unit. Be sure that the rotation of the wheel is correct as indicated by directional arrows on the unit. If proper rotation, apply full electrical power.
3. With the air system in full operation and all ducts attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.

Maintenance

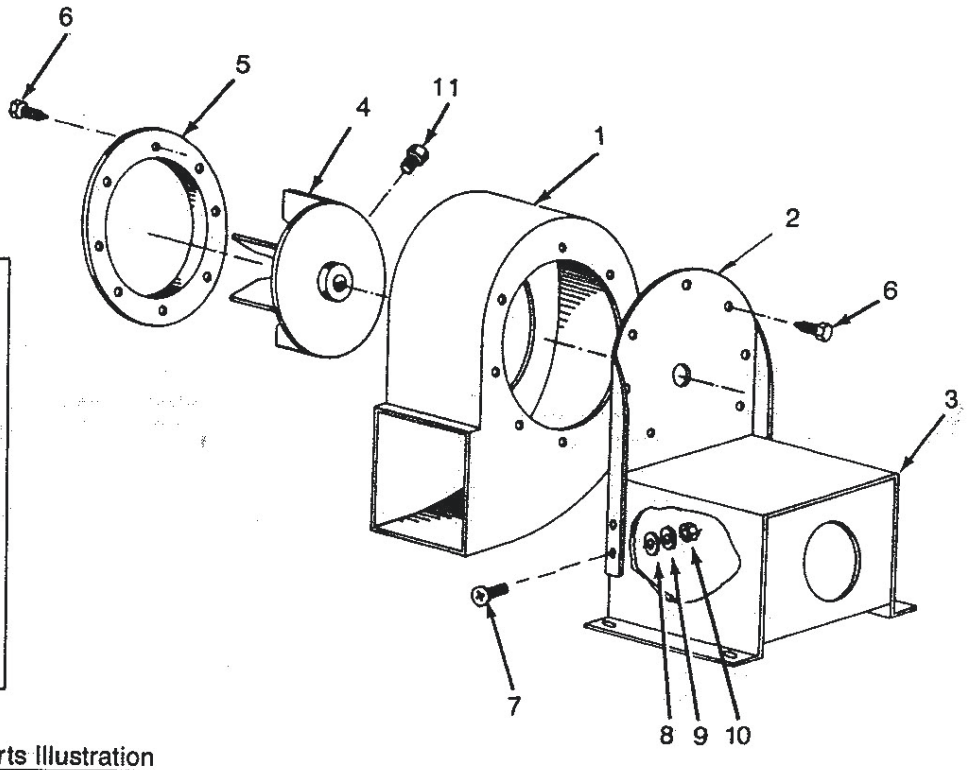
⚠ CAUTION

Before attempting any repair work, be certain that all power to the motor and electrical accessories are turned off and locked in the off position.

A. Periodically remove dirt from blower wheel and housing.
B. Check tightness of wheel setscrews.
C. After disconnecting the power source, check the wiring to see if insulation is damaged or frayed.
D. Relubricate motor per manufacturer's instructions. Remove any excess lubricants.

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Noise.	1. Foreign objects in housing. 2. Loose setscrew on wheel. 3. Incorrect wheel rotation.	1. Remove. 2. Tighten. 3. Reverse rotation.
Motor bearing noise.	Lack of bearing lubrication.	Lubricate.
Excessive vibration.	1. Loose wheel on shaft. 2. Loose mounting bolts. 3. Motor out of balance. 4. Wheel out of balance. 5. Accumulation of material on wheel.	1. Tighten setscrews. 2. Tighten. 3. Replace. 4. Replace or rebalance. 5. Clean.
Motor overloaded.	System static pressure less than 1" water column.	Increase system static pressure.



ORDER REPLACEMENT PARTS BY CALLING TOLL FREE

1-800-323-0620

Please provide the following information:

- Model Number
- Serial Number (if any)
- Parts Description and Number as shown in Parts List

Address parts correspondence to:

Parts Company of America
1657 Shermer Road
Northbrook, IL 60062-5362

Figure 4 — Replacement Parts Illustration

Replacement Parts List

REF. NO.	DESCRIPTION	PART NO. FOR MODEL:				
		2C940	2C820	4C108	4C329	4C330 (‡)
1	Housing scroll	201-08-4005-5	201-09-4003-5	201-11-4005-5	201-12-4004-5	201-14-4005-5
2	Base upright	618-08-7001-5	618-09-7001-5	618-11-7002-5	—	—
3	Motor base assembly	203-08-7001-5	203-09-7001-5	203-11-7005-5	203-12-4016-5	203-14-4011-5
4	Wheel	602-08-4001-5	602-09-4001-5	602-11-4002-5	602-12-4004-5	602-14-4003-5
5	Inlet ring	609-08-4002-5	609-09-4001-5	609-11-4003-5	602-12-4003-5	609-14-4001-5
6	Hex hd. screw	#10 x 3/8" 8 Req'd.	#10 x 3/8" 14 Req'd.	#10 x 3/8" 14 Req'd.	5/16-18 x 3/4" 16 Req'd.	5/16-18 x 3/4" 16 Req'd.
7	Slotted machine screw*	1/4-20 x 1/2" 4 Req'd.	1/4-20 x 1/2" 4 Req'd.	1/4-20 x 1/2" 4 Req'd.	—	—
8	Flat washer*	1/4 4 Req'd.	1/4 4 Req'd.	1/4 4 Req'd.	—	—
9	Split washer*	1/4 4 Req'd.	1/4 4 Req'd.	1/4 4 Req'd.	5/16 16 Req'd.	5/16 16 Req'd.
10	Hex nut*	1/4"-20 4 Req'd.	1/4"-20 4 Req'd.	1/4"-20 4 Req'd.	—	—
11	Setscrew	†	†	†	†	†

NOTE — Models 4C329 and 4C330 have welded 1 piece motor base & upright assembly.
(‡) Model 4C330 has inlet upright supports (not shown) to support housing. Order by P/N 617-13-7002-5.
(*) Standard hardware item, available locally.
(†) Available with wheel.

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Inspection Checklist for Supervisors

Facility:			Date:	
	Activity	**Yes**	**No**	**Remarks**
A.	**Safety**			
1.	Is there adequate personal protective equipment (PPE)?			
2.	Is the PPE being used?			
3.	Is the PPE in good condition?			
4.	Is there restricted entry to the waste incineration/ash disposal site?			
5.	Is there functional fire safety equipment?			
6.	Do the operators know how to use the equipment?			
7.	Is there adequate first aid kit?			
8.	Are the operators conversant with use of the kit?			
9.	Is flammable material stored away from the incinerator?			
10.	Are warning signs distinctly displayed?			
Additional Comments on Safety:				

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Inspection Checklist for Supervisors

B.	Operation			
	Activity	**Yes**	**No**	**Remarks**
1.	Is there a sufficient supply of fuel?			
2.	Is the procedure for preparation of waste for incineration being followed?			
3..	Is the incinerator cleaned daily?			
4.	Is the waste weighed upon reception?			
5.	Is the waste temporarily stored neatly?			
6.	Is the loading of incinerator done in the right way?			
7.	Is the temperature regulated adequately during the burn?			
8.	IS the incinerator allowed to burn down and cool before cleaned?			
9.	Is the ash properly disposed as specified by compliance procedures?			
10.	Are the following tools and equipment available?			
a.	Ash Rake			
b.	Shovel			
c.	Hand brush/Dustpan			
d.	Hard broom			
e.	Non-Combustible Ash Disposal Drums			
f.	Weighing Scale			
g.	Fire Extinguisher			
h.	Fire Retardant Gloves			
i.	Eye Protection/ Face Mask			
j.	Fire Retardant Coveralls or suitable clothing to cover the upper body, including the lower arms			
k.	Safety First Aid Kit			
Additional Comments on Operation:				

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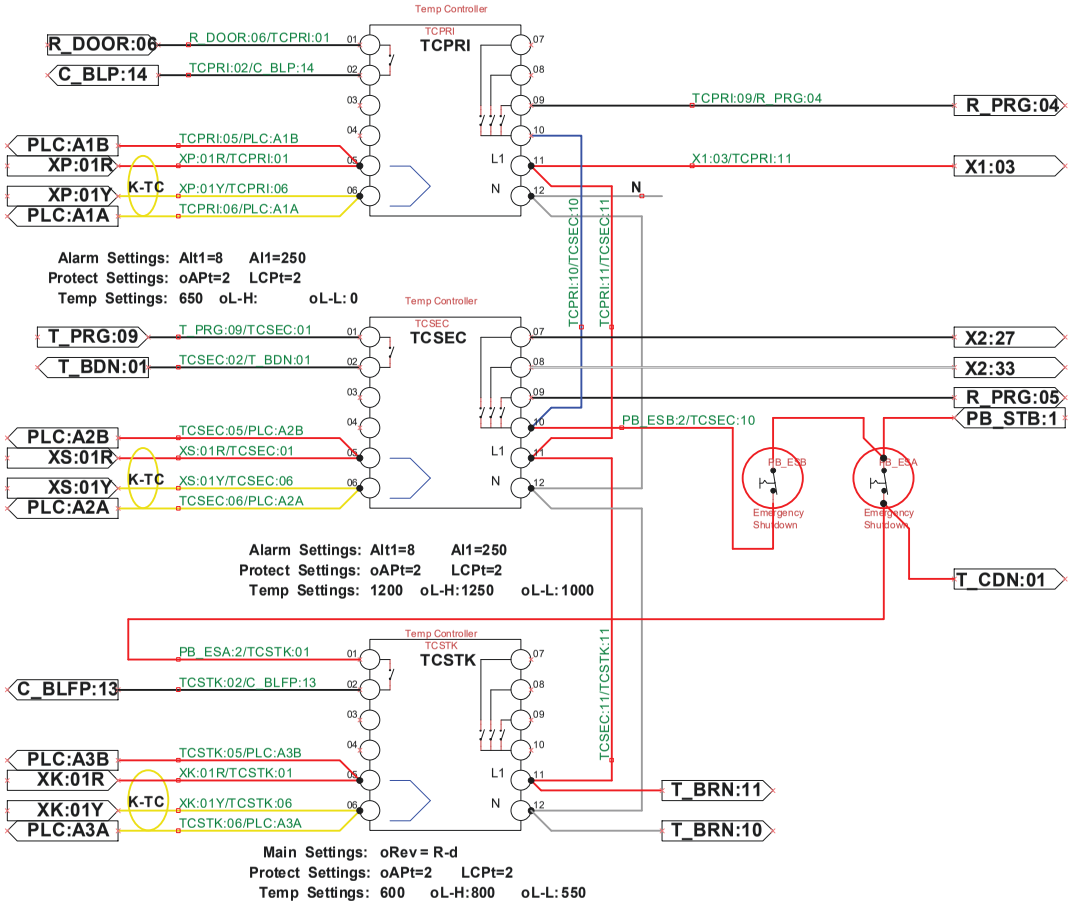
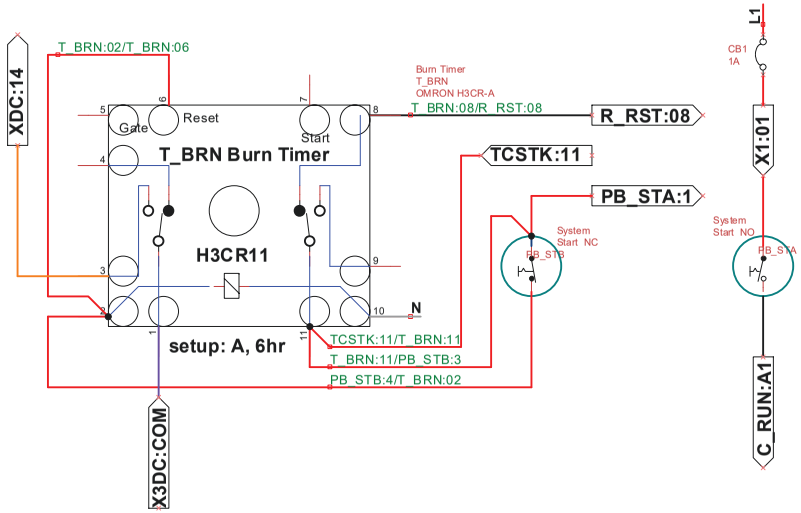
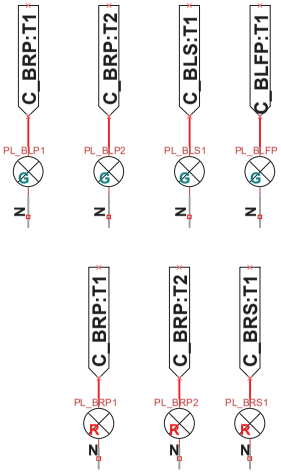
Inspection Checklist for Supervisors

C.	Maintenance			
	Activity	**Yes**	**No**	**Remarks**
1.	Is there evidence of cracks in the refractor? (Do not include heat expansion cracks)			
2.	Is there good housekeeping?			
3.	Is the status of the ash handling and disposal system good?			
Additional Comments on Maintenance:				
D.	**Records**			
	Activity	**Yes**	**No**	**Remarks**
1.	Are the relevant forms available?			
2.	Are the forms filled accurately and completely?			
3.	Are incidents recorded?			
4.	Are reports of the waste incinerated done on time?			
Additional Comments on Records:				
Name of Supervisor:		Signature:		Designation:



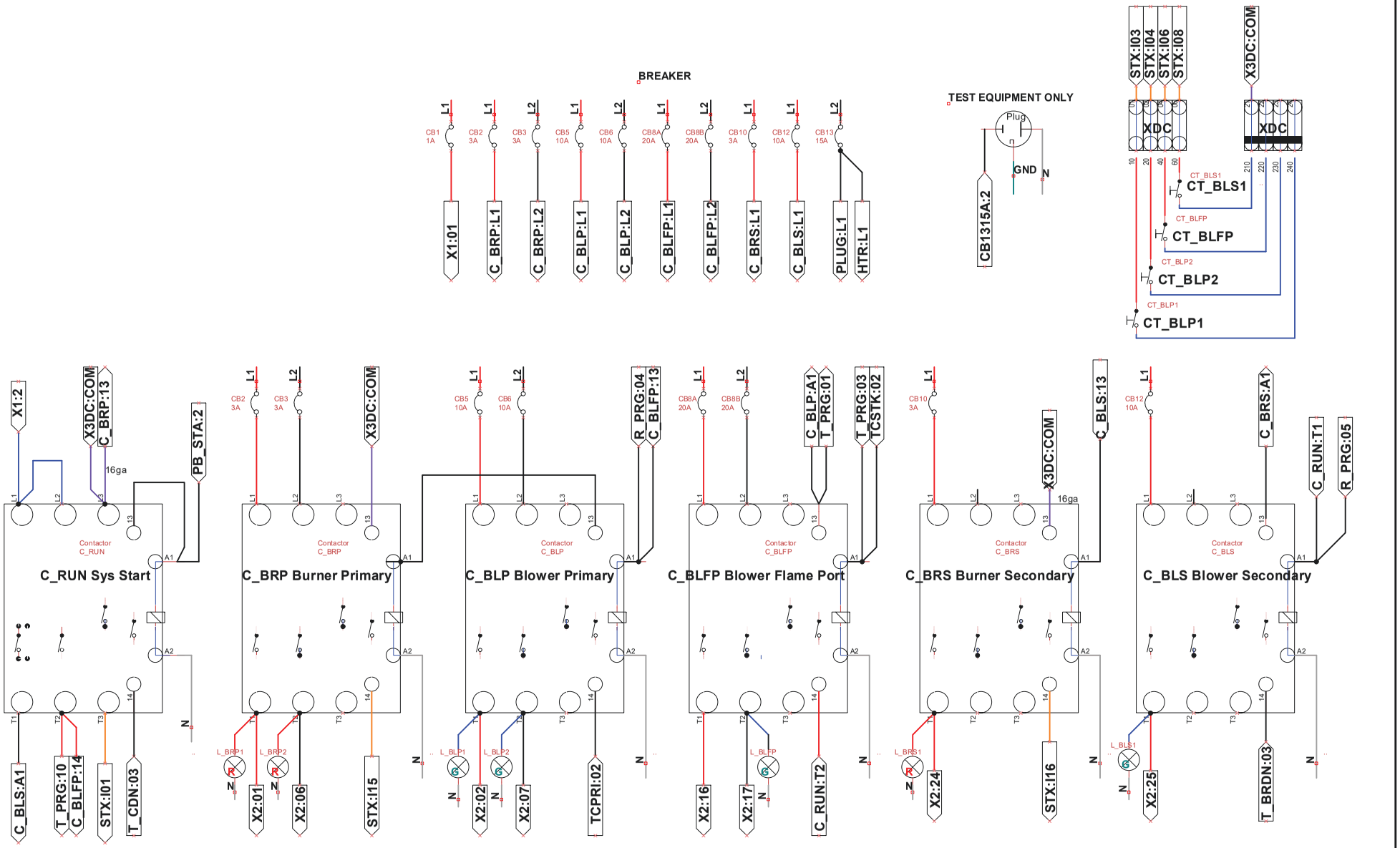




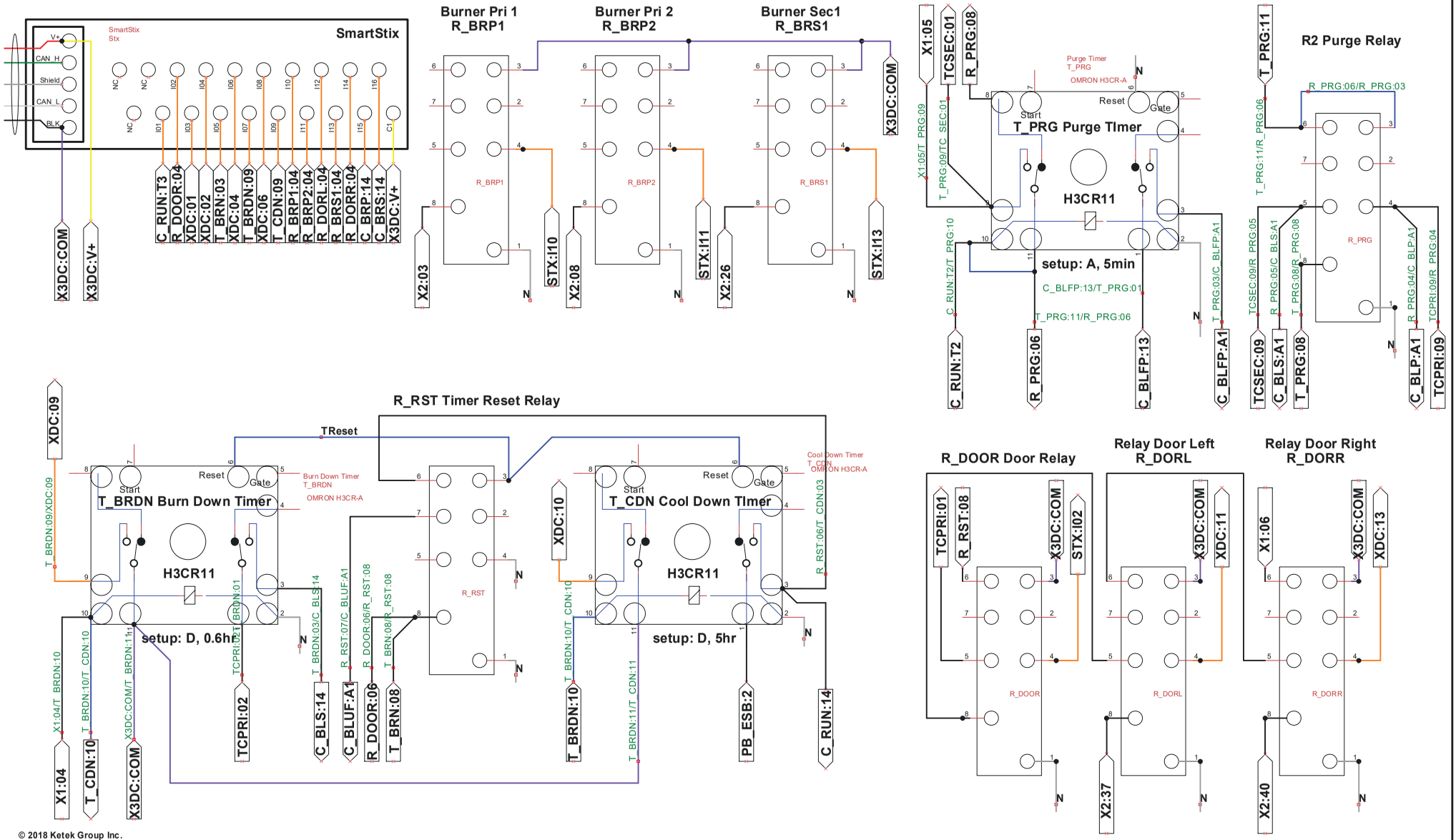
Run following wires between the PLC input I1-I6 and to a terminal strip with 6 terminals on the BackPan (Closer to Smartstix Module)

- 6 16GA Orange

Title: TCPRI, TCSEC, TCSTK Temperature Controllers		
Author: Jeffrey Prado, kurt klingbeil		KETEK GROUP INC.
File: CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn		Document
Revision: 1.18	Date: 2019-03-25	Sheets: 1 of 6

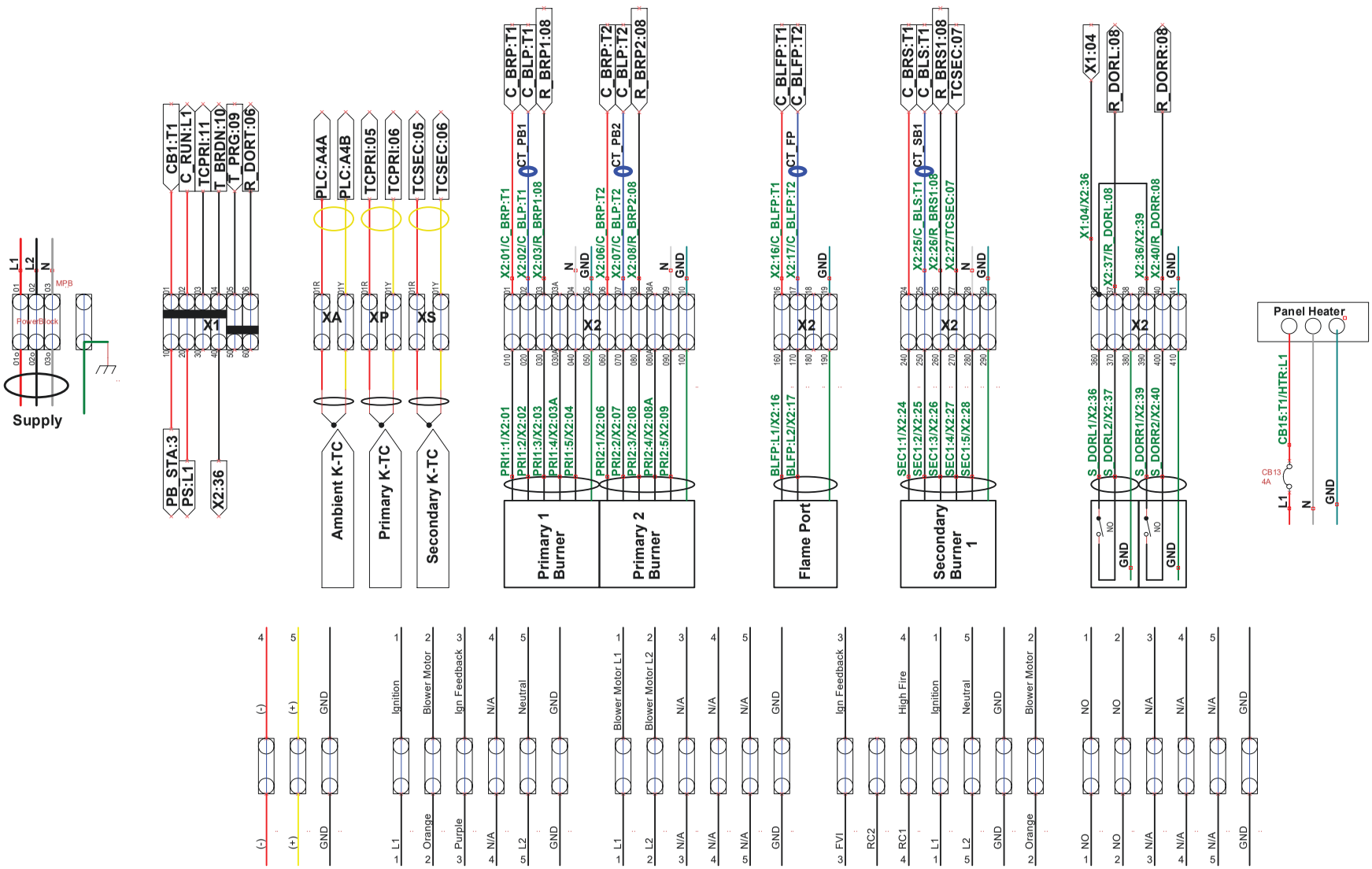


Title: C1 - C9 Burner & Blower Contactors		
Author: kurt klingbeil, Ketek Group Inc		KETEK GROUP INC.
File: CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn		Document
Revision: 1.18	Date: 2019-03-25	Sheets: 2 of 6

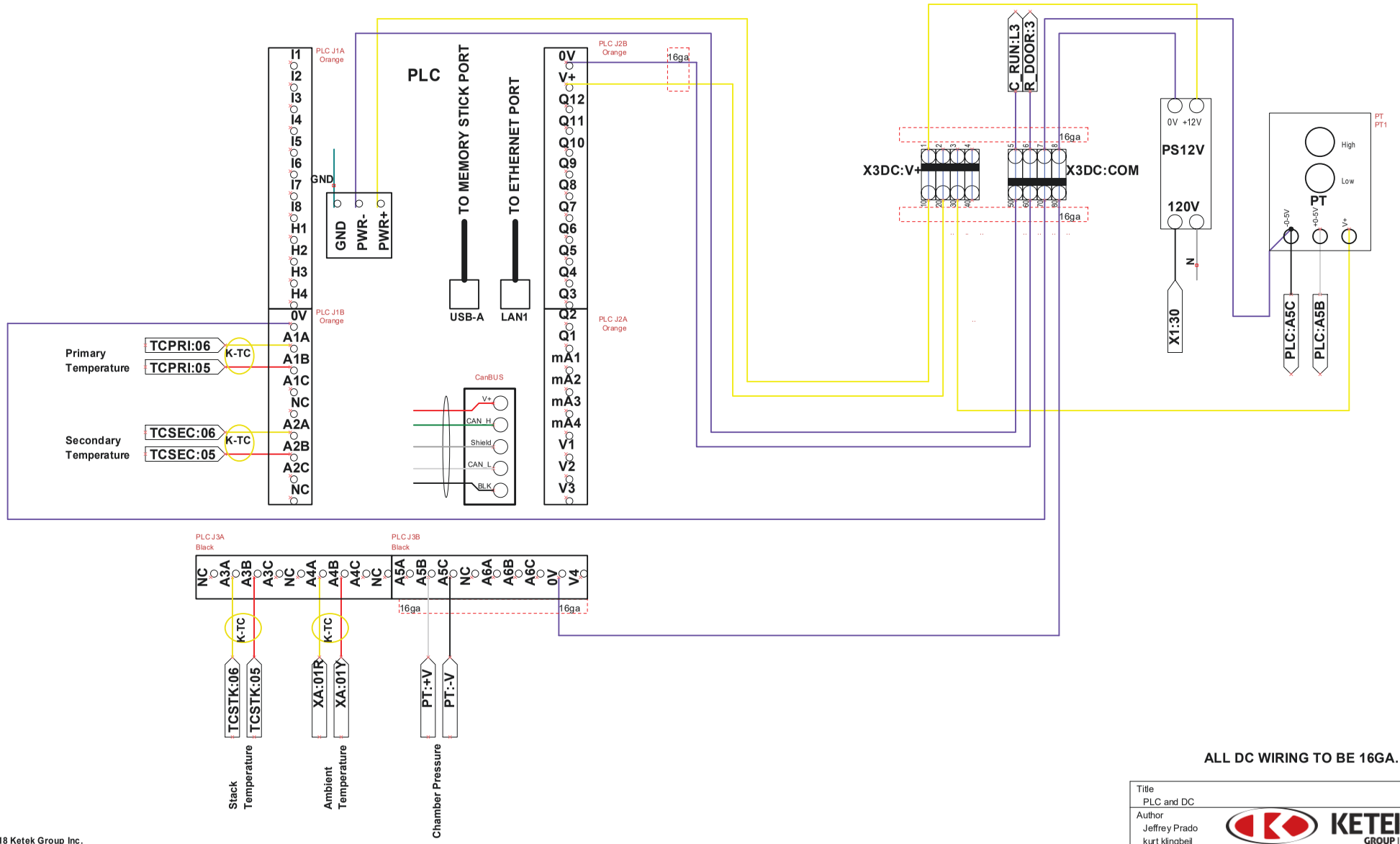


Title	Timers and Relays
Author	kurt klingbeil Jeffrey Prado
File	CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn
Document	
Revision	1.18
Date	2019-03-25
Sheets	3 of 6

KETEK GROUP INC.

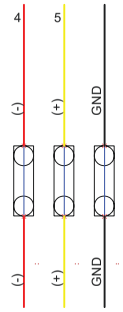


Title: Terminal Strips and PLC STX inputs		
Author: kurt klingbeil, Jeffrey Prado	KETEK GROUP INC.	
File: CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn		Document
Revision: 1.19	Date: 2019-04-08	Sheets: 4 of 6

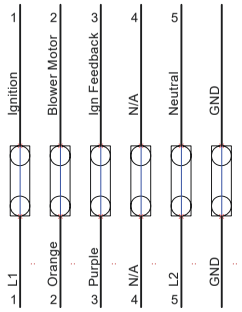


ALL DC WIRING TO BE 16GA.

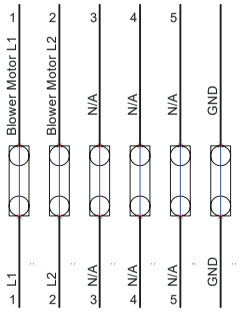
Title: PLC and DC		
Author: Jeffrey Prado, kurt klingbeil		KETEK GROUP INC.
File: CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn		Document
Revision: 1.19	Date: 2019-04-08	Sheets: 5 of 7



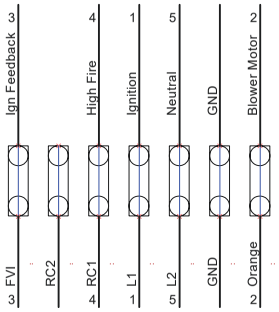
Thermocouple



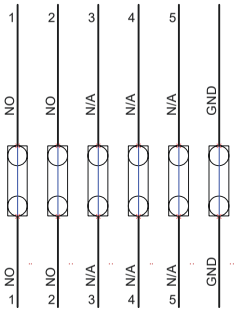
Primary Burners 1& 2



Blower



Secondary Burners



Door Switch L & R

Title: Burner Terminations		
Author: Jeffrey Prado kurt klingbeil	KETEK GROUP INC	
File: CY101_DblSchemHorner20190510kk_hb_jp_jp.dsn		Document
Revision: 1.18	Date: 2019-03-25	Sheets: 6 of 6

CERTIFICATE OF REGISTRATION

This is to certify that

Ketek Group Inc.

Edmonton Operation Centre

20204 110 Avenue NW, Edmonton, Alberta, T5S 1X8, Canada

Refer to Attachment to Certificate of Registration dated March 17, 2021 for additional certified sites

operates a

Quality Management System

which complies with the requirements of

ISO 9001:2015

for the following scope of certification

Design and manufacture of oilfield, construction and solid waste treatment equipment and maintenance of pumps and gensets.

Certificate No.:	CERT-0115970	Original Certification Date:	July 17, 2013
File No.:	1647520	Certification Effective Date:	March 18, 2021
Issue Date:	March 17, 2021	Certification Expiry Date:	March 17, 2024

Frank Camasta
Global Head of Technical Services
SAI Global Assurance

ISO 9001

KETEK GROUP INC.

Warranty - New

1. Ketek Group Inc. hereby warrants to the Purchaser, for a one (1) year period of time from the date of acceptance and upon the conditions hereinafter set forth, each new product sold by it, to be free from defects in material and workmanship (specifically excluding there from component parts and accessories manufactured, furnished, and supplied by others) under normal use, maintenance and service. Except for the above Warranty, it is agreed and understood that no other WARRANTY or CONDITION whether express, implied, or statutory is made by Ketek Group Inc.
2. The obligation of Ketek Group Inc. under this Warranty shall be limited to the repair or replacement (**not in excess of its factory labour rate**) of its units; which, upon examination by Ketek Group Inc., shall disclose to their satisfaction to have been defective in material and/or workmanship under normal use, maintenance, and service.
3. The foregoing shall be the Purchaser's sole and exclusive remedy whether in contract, tort, or otherwise; and Ketek Group Inc. shall not be liable for injuries to persons, for damage to property or for loss of any kind which results (whether directly or indirectly) from such defects in material or workmanship, or for any other reason; and, it is agreed and understood that the Purchaser shall keep Ketek Group Inc. indemnified against any such claim. In no event shall Ketek Group Inc. be liable for incidental or consequential damages, or commercial losses, or for any loss or damage except as set forth in paragraph 2 herein.
4. This Warranty does not apply to, and no warranty or condition is made by Ketek Group Inc. regarding any purchased components, parts, and accessories; manufactured, supplied and/or furnished by others, or any non-standard features or items specified by the Purchaser; nor does this Warranty expand, enlarge upon, or alter in any way, the warranties provided by the makers and suppliers of such component parts and accessories.
5. The liability of Ketek Group Inc. under this Warranty shall cease and determine if:
   (a) The Purchaser shall not have paid in full all invoices as submitted by Ketek Group Inc., or affiliated companies on or before their due dates:
   (b) Representatives of Ketek Group Inc., are denied full and free right of access to the units:
   (c) The Purchaser permits persons other than the agents of Ketek Group Inc. or those approved or authorized by Ketek Group Inc. to effect any replacement of parts, maintenance, adjustments, or repairs to the units:
   (d) The Purchaser has not properly maintained the units in accordance with instructions, pamphlets or directions given or issued by Ketek Group Inc. at the time of the sale and/or from time to time thereafter:
   (e) The Purchaser uses any spare parts or replacements not manufactured by or on behalf of Ketek Group Inc. and supplied by it, or by someone authorized by it, or fails to follow the instructions for the use of the same:
   (f) The Purchaser misuses, or uses this unit for any purpose other than that for which it was intended or manufactured:
   (g) The defective parts are not returned to Ketek Group Inc. within 15 days of repair.
6. No condition is made or is to be implied, nor is any Warranty given or to be implied as to the life or wear of the units supplied; or that they will be suitable for use under any specific conditions; notwithstanding that such conditions may be known or made known to the seller.
7. Defects in material and/or workmanship must be brought to the attention of Ketek Group Inc. by written notification within ten (10) days of discovery, and repairs must be commenced within forty-five (45) days thereafter.
8. It is agreed and understood that the Purchaser is responsible for and must pay for the transporting of the defective goods or of the replacement parts to the place of repair. Premium freight charges (such as air express or air fare charges for transportation of personnel, tools and for replacement parts) and other expenses, apart from servicemen's regular straight time travel, mileage, and regular straight time labour required to repair or replace defective parts and the cost of the parts, will be paid for by the customer at Ketek Group Inc. regular billing rates on usual credit terms.
9. The liability of Ketek Group Inc. under this Warranty is limited to the purchase price of the unit and in no case shall a claim be advanced for more than such amount.
10. All repairs and replacements are made and furnished subject to the same terms, conditions, warranties, disclaimer or warranty and limitations of liability and remedy as applied to each new unit sold.
11. This warranty and the Purchaser's rights under it, is not transferable, or is it assignable.

DATE IN SERVICE: _____ PURCHASED BY: _____

MODEL NUMBER: _____ SELLING BRANCH: _____

SERIAL NUMBER: _____

APPENDIX C • TECHNICAL SPECIFICATIONS OF WASTE OIL BURNER

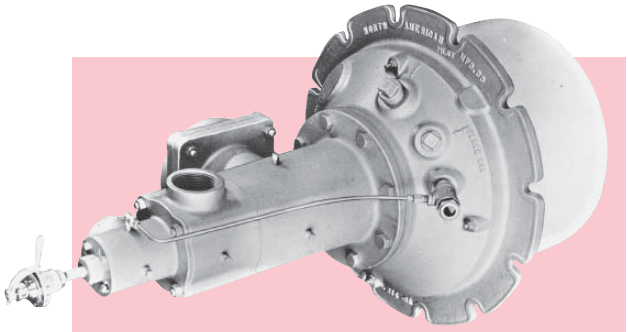
fives north american

FIRE•ALL™ DUAL-FUEL™ BURNERS

Bulletin 6514

February 2011

- **Dual Fuel Burner – gas or oil (light or heavy grade oil)**
- **Conventional forward flame pattern**
- **1.8 to 30 million Btu/hr**
- **Chambers up to 2400F (with alloy nose)**
- **Includes low pressure fuel oil atomizer**



6514 Burner Complete shown with optional (recommended) Sensitrol™ Oil Valve.

6514 FIRE•ALL Dual-Fuel Burners are nozzle mix, sealed-in burners for gas, light oil, or heavy oil. Capable of efficient operation throughout a wide temperature range, these burners are equally at home on low temperature ovens and high temperature forge and melting furnaces.

Ruggedly built for sustained, maintenance-free operation, 6514 Burners also provide for quick change of fuels without disturbing process operations.

Sealed mountings help maintain furnace pressure, controlled atmosphere, and closer air/fuel ratio control--all contributing to better product quality.

Fire•All Burners are a proven workhorse on all types of furnaces.

COMBUSTION CHARACTERISTICS

Oil. Oil viscosity at the burners must not exceed 100 SSU. Oil pressure at air/fuel Ratiotrol™ should be between 25 and 30 psi. Oil pressure at rated capacity is 10 to 15psi at Sensitrol™ and less than 1 psi at burner. Minimum atomizing air pressure at the burners is 14 osi for light oil, 22 osi for heavy oil.

Gas. Atomizing air (4 osi minimum) should be left on to protect the atomizer. Maximum required natural gas pressure at the burner for stoichiometric ratio is less than 4osi.

Air/Fuel Ratio. 6514 Dual-Fuel Burners are stable throughout a wide range from excess fuel to excess air. They can operate with excess fuel without forming carbon, but additional air for complete combustion must be available in the furnace near the burner.

For limits in a specific case, either rich or lean, consult Fives North American.

Turndown. Fire•All Burners can be turned down to atomizing air only (with fuel to match) except when burning residual oils in a cold, tight furnace.

Total air capacities (including main and atomizing air)

Burner designation	16 osi air pressure drop across the burner: Air① scfh	Light oil② gph	Heavy oil③ gph	Gas④ scfh	24 osi air pressure drop across the burner: Air scfh	Light oil gph	Heavy oil gph	Gas scfh	Approx. flame lengths with 16 osi main air (in open furnace)
6514-6	17 900	13	12	1 790	21 900	16	15	2 190	4' - 5'
6514-7	28 400	21	19	2 840	34 800	26	23	3 480	5' - 6'
6514-8-A	48 900	36	33	4 890	60 000	44	40	6 000	8' - 9'
6514-8-B	81 500	60	54	8 150	100 000	74	67	10 000	9' - 12'
6514-9	165 000	122	110	16 500	202 000	150	135	20 200	15' - 18'
6514-10	247 000	183	165	24 700	303 000	224	202	30 300	20'

① For Btu/hr, multiply by 100 ② Light oil at 135 000 Btu/gal. ③ Heavy oil at 150 000 Btu/gal. ④ Natural gas at 1000 Btu/cf.

Burner designation	Main air capacities in scfh: Air pressure drop across the burner in osi 1	5	6	8	12	16	Atomizing air capacities in scfh: Air pressure drop across the burner in osi 14	16	18	20	22	24
6514-6	3 710	8 300	9 100	10 500	12 900	14 900	2 800	3 000	3 180	3 360	3 510	3 660
6514-7	6 100	13 600	15 000	17 200	21 000	24 400	3 770	4 030	4 270	4 500	4 720	4 900
6514-8-A	10 600	23 700	26 000	30 000	36 700	42 400	6 050	6 500	7 000	7 300	7 600	7 850
6514-8-B	17 600	39 200	43 000	49 600	60 500	70 000	10 600	11 300	12 000	12 700	13 200	13 800
6514-9	36 600	82 000	89 500	104 000	127 000	146 000	17 200	18 400	19 600	20 700	21 600	22 500
6514-10	54 500	122 000	135 000	154 000	189 000	218 000	27 200	29 100	30 900	32 600	34 100	35 500

Flame Supervision. An ultraviolet cell‡ will monitor pilot or main flame on gas or oil. For maximum safety, Fives North American urges **interrupted** pilots when flame safeguards are used--pilots should be on only for a preset ignition period (usually 15 seconds), after which flame supervision detects main fire only. Adapters for mounting flame detection devices on 6514 Burners are tabulated on Bulletin 8832.

Tile/Installation. Burner tiles are cast refractory rated for 2800F furnace temperature. They should be supported securely in the furnace wall by castable refractory (not insulation) at least 9" thick all around the tile, extending back to the furnace shell and securely anchored to it. (See Supplement DF-M1.)

Tiles are replaceable in the field except for the 6514-10, whose mounting must be returned to the factory for tile replacement (or purchase a spare mounting plate with a tile cast onto it).

Complete burners include tile, mounting plate, and an observation port into which a small quantity of atomizing air is introduced to keep the glass clear. Order pilot tips and Sensitrol™ Oil Valve separately. See 6514 Dimension Sheet for recommended Sensitrol™ oil valve and premix pilot tip.

Jacketed Tile options are available for applications where the tile is not supported by furnace refractory. Jackets are available in three different metals and have maximum temperature ratings for each. They must be protected with sufficient insulation so as not to exceed rated temperature.The maximum temperature rating depends upon frequency of heat-up/cool-down cycles. As an example, batch annealing furnaces that are heated and cooled every day should use the "intermittent exposure" ratings. Continuous annealing furnaces that remain at the same temperature for months at a time, can use the higher "continuous" rating.

Designation	Jacket Metal	Continuous max.temp.	Intermittent exposure
6514- -LC	carbon steel	700 F	700 F
6514- -L4	304 stainless	1600 F	1500 F
6514- -L9	309 stainless	1900 F	1800 F

‡ Cleaning air must be introduced into the port downstream of the sensor to keep oil and poc's off the lens.

Burner Nose options are available for sizes shown below and can be specified in the product number. The burner nose establishes main combustion air flow and influences flame propagation. Nose material is either cast iron that is suitable for cold air applications up to 1800F, or cast stainless alloy for preheated air (maximum 700F) applications up to 2400F.

Mat'l	Cap'y	-6	-7	-8A	-8B	-9	-10
Cast iron	1.0	√	√	√	√	√	√
Cast Alloy	1.0	√	√	√	√	√	√
Cast iron	1.1		√	√	√	√	√
Cast Alloy	1.1		√	√	√	√	√
Cast iron	1.2			√	√	√	√
Cast Alloy	1.2			√	√	√	√
Cast iron	1.3			√	√	√	√
Cast Alloy	1.3			√	√	√	√

The product designation 1.0 represents standard main air capacity shown on page 1. Use of an extra capacity burner nose will result in either more air at 16 osi or standard air flow at lower pressure. Extending the capacity of the burner by increasing air pressure beyond 16 osi, or using the extra capacity nose, is acceptable for most gas and light oil applications. Specific applications involving either low Btu fuels or heavy oil and extra capacity should be reviewed with Fives North American.

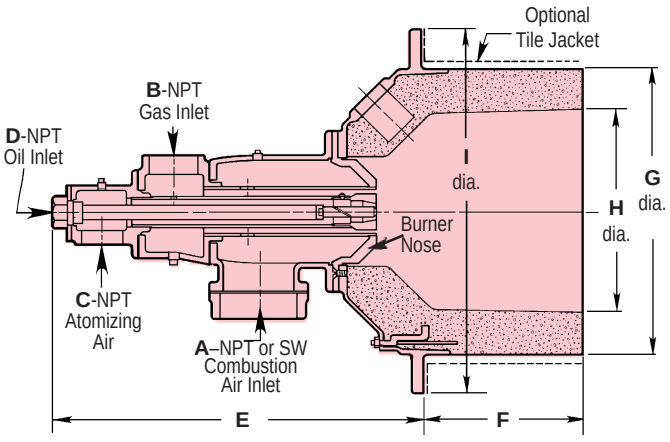
Also, when firing extra capacity, the combustion air flow velocity within the supply piping, and associated pressure loss, can be excessive for some burners. The -8B, -9 and -10 products when operated at 1.2 or 1.3 capacity will develop high pipe velocity based on the burner's air connection size. As an alternative to increasing blower pressure, an oversized air inlet can be purchased separately for these size burners. The connections are SW-type (slip-on sleeve or welded construction) and are one pipe size larger than the standard supply. Nose and oversize air connection part numbers can be found in supplement literature (see Parts List and Burner Options documents).

Options are available for the 6514 burner but require consultation with your Fives North American for application and ordering information. See Sheet 6514-3 for an overview of burner options.

CLEARANCE DIMENSIONS (for details, see Dimensions 6514)

Burner designation	dimensions in inches A†	B	C	D	E	F	G	H	I	Wt. lbs.
6514-6	3	2	1½	⅜	18¾	9	15	10⅜	19½	195
6514-7-	4	2½	2	⅜	20 13/16	8⅞	16	11⅜	20½	225
6514-8-A	6	2½	2½	⅜	27 1/16	10	17¾	12⅜	22¾	335
6514-8-B	6	3	3	⅜	31¼	12⅞	19	13½	24	450
6514-9	8	4	4	½	38⅝	13 7/16	23	16	28	795
6514-10	10	6	6	½	45⅛	13⅝	27½	20½	32½	1035

† SW connection standard for -9 and -10 only.



DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC.
IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

Ordering Information

6514 - _ _ _ / _ _ / _ _ _ _

Product Size
Connection

6 ..... 3"
7 ..... 4"
8-A ..... 6"
8-B ..... 6"
9 ..... 8"
10 .....10"

Tile

BO .. burner only
LX... refractory tile (no jacket)
LC... steel tile jacket
L4 ... 304 stainless jacket
L9 ... 309 stainless jacket

Burner Nose

Capacity	Material
1.0 ... main air capacity	H...cast iron
1.1 ... 1.1 x main air capacity	A...alloy
1.2 ... 1.2 x main air capacity	
1.3 ... 1.3 x main air capacity	

Example 1 6514-8-A/LC/1.2A Fireall gas burner complete with carbon steel jacketed tile and 1.2 capacity alloy nose
Example 2 6514-6/BO/1.0H Fireall gas burner only with standard capacity iron nose
Example 3 6514-9/LX/1.2H Fireall gas burner complete with refractory tile and 1.2 capacity iron nose

Note: See Supplement 6514-6 for cross referencing old product numbers.

Fives North American Combustion, Inc. - 4455 East 71st Street - Cleveland, OH 44105 USA - Phone 216.271.6000
Fax 216.641.7852 - email: fna.sales@fivesgroup.com - www.fivesgroup.com/fivesna

APPENDIX D • REGISTRATION FORM FROM THE NUNAVUT DEPARTMENT OF ENVIRONMENT: USED OIL AND WASTE FUEL APPLIANCE

APPENDIX 4 – REGISTRATION FORM: USED OIL AND WASTE FUEL APPLIANCE

A copy of the Used Oil and Waste Fuel Appliance registration form and user's guide is available by contacting the Nunavut Department of Environment or by downloading the documents at http://env.gov.nu.ca/programareas/environmentprotection. Although registration is voluntary, it enables Nunavut's Department of Environment to better manage used oil and waste fuel by maintaining an up-to-date inventory of certified appliances operating in Nunavut.

Instructions

1. The following information must be provided in order to register a used oil or waste fuel appliance and obtain a registration number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Environmental Protection Division, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying user's guide for further assistance on completing the generator registration form.
5. There is no fee for registering a used oil or waste fuel appliance with the Department of Environment.

Section 1 - Identification

Applicant (Legal Name) Agnico Eagles Mines Limted- Meliadine Project

Mailing Address Suite 879- Rankin Inlet, Nunavut, Canada

Postal Code X0C 0G0

Principle Contact Person Martin Theriault Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171 Email martin.theriault@agnicoeagle.com

Section 2 – Description of Operation

General Type of Business Mining Industry

Site Location(s) Where the Waste is Generated Meliadine project, Rankin Inlet- Incinerator area

Make, Model and Size of the Appliance 5000L waste oil tank- Hassco- 5000L DW S601

Waste Oil tank level switch- Ketch industrail FS301-01: Mixer- NP HGL 3.3

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) 2019-01- 16

Print Name of Contact Person Martin Theriault Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171 Email martin.theriault@agnicoeagle.com

For Department Use Only

Appliance Registration Number NUA# _____ Approved by _____ Date _____