



INCINERATOR MANAGEMENT PLAN

HOPE BAY, NUNAVUT

April 2016

PLAIN LANGUAGE SUMMARY

This Plan describes the waste management processes at Hope Bay relevant to on site incineration. This Plan ensures that 1) only appropriate burnable material enters the incinerator waste stream, 2) animal attractants are promptly incinerated, 3) the incinerator is operated in a manner that reduces harmful emissions, 4) residual ash is handled and disposed of properly, and 5) that all compliance monitoring and reporting associated with incinerator operations occurs.

REVISION HISTORY

Revision #	Date	Section	Summary of Changes	Author	Approver
0	May 2009		Initial issuance of Incinerator Management Plan		HBML
1	Feb 2012		Update and revise Incinerator Management Plan	KBL Environmental	HBML
1.1	Mar 2012		General document revision	HBML	HBML
2	Sept 2015		Updated to TMAC ownership and format, added glossary, added plan implementation information, update 2AM- Licence number references and requirements, add related documents and relevant legislation tables, updated information on incinerators in use, updated ash management section, included reference to NPRI reporting, added contingencies section	TMAC	TMAC

GLOSSARY AND ACRONYMS

TERM	DEFINITION
CCME	Canadian Council of Ministers of the Environment
CWS	Canada-wide Standards
NIRB	Nunavut Impact Review Board
NPRI	National Pollutant Release Inventory
NWB	Nunavut Water Board
PCDD	Poly-chlorinated dibenzo-dioxin
PCDF	Poly-chlorinated dibenzo-furan
PVC	Poly-vinyl chloride
TDG	Transport of Dangerous Goods (Act or Regulations)
TMAC	TMAC Resources Inc.

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Module A: 2AM-DOH1323 (Doris)

Module B: 2BE-HOP1222 (Windy)

Module C: 2BB-BOS1217 (Boston)

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1. INTRODUCTION

This Hope Bay Incinerator Management Plan (the Plan) has been prepared by TMAC Resources Inc. (TMAC) in accordance with the water licences held by TMAC. The Plan is intended primarily for use by TMAC and its contractors to ensure that best practices for domestic waste incineration are followed, and that the conditions of water licences and project permits are met.

This Plan is structured in a manner such that one document pertaining to domestic waste incineration is approved and implemented across all TMAC Hope Bay project sites, while still addressing site- and licence-specific needs. The main document outlines TMAC's approach to domestic waste stream segregation and incinerator management as it pertains to all TMAC Hope Bay developments. Appended modules provide details for each site and the associated water licence. In the event of a new water licence, or an existing licence amendment, only the specific modules pertaining to that licence and site will need to be revised. This is intended for consistency and efficiency across operations and for compliance management.

1.1. OBJECTIVES

The main objective of this Plan is to ensure domestic waste incinerators are operated in a safe, efficient and environmentally-compliant manner. Consistent with TMAC's intent to be a responsible operator, these objectives are described as follows:

- Compliance with the Environmental Guidelines for the Burning and Incineration of Solid Waste (Government of Nunavut Environmental Protection Division)
- Compliance with the Environment Canada Technical Document for Batch Waste Incineration
- Compliance with the Canadian Council of Ministers of the Environment Canada-Wide Standards for Mercury Emissions and Dioxins and Furans
- Compliance with Project Certificate and Water Licence requirements;
- Prevention of public health risk;
- Protection of the operator;
- Protection of surface and ground water;
- Protection of land;
- Protection of local flora and fauna species; and
- Conservation of resources.

This Incinerator Management Plan has been developed to ensure that these factors are built into the TMAC operational approach at Hope Bay. It discusses the importance of waste management and reduction of specific waste streams to ensure Canada Wide Standards (CWS) for dioxins, furans and mercury are achieved.

1.2. RELEVANT LEGISLATION AND GUIDANCE

Table 1 List of federal and territorial regulations governing the Hope Bay Incinerator Management Plan

Regulation/Guideline	Year	Governing Body	Relevance
Canada Wide Standards for Dioxins and Furans	2001	Environment Canada	Contains stack testing requirements triggered by waste volumes incinerated, and numeric targets for dioxins and furans.
Canada Wide Standards for Mercury Emissions	2000	Environment Canada	Contains numeric targets for mercury.
Technical Document for Batch Waste Incineration	2010	Environment Canada	Contains recommendations for batch waste incineration to achieve emissions compliance.
Environmental Guideline for the Burning and Incineration of Solid Waste	2012	Government of Nunavut – Department of Environment	Identifies pollutants of concern, outlines best management practices for burning of wastes, types of wastes that can be burned, and ash management.
Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities	2011	Government of Nunavut – Department of Environment	Provides the criteria that determines if process residuals (incl. incinerator ash) may be disposed in a municipal landfill, or is classified as a hazardous waste.

Canada-wide Standards (CWSs) are intergovernmental agreements developed under the *Canadian Council of Ministers of the Environment (CCME)*. CWSs can include qualitative or quantitative standards, guidelines, objectives and criteria for protecting the environment and reducing risks to human health. Canada has identified dioxins, furans and mercury as emission products that need to be managed as they pose a potentially significant health and environmental threat. Hope Bay's Project Certificate and NWB water license for the Doris North Project states that these emissions must be in compliance with the CWSs for dioxins, furans and mercury.

The Technical Document for Batch Waste Incineration was issued by Environment Canada in January 2010 and is intended to act as a guideline for owners and operators of various incinerators. The technical document focuses on batch waste incinerators ranging in size from 50 to 3,000 kg of waste per batch. Batch waste incinerators are those that operate in a non-continuous manner (i.e. they are charged with waste prior to the initiation of the burn cycle, and the door remains closed until the ash has cooled inside the primary chamber). Batch waste incineration is the type of incineration process utilized at Hope Bay for domestic wastes.

The document recommends and describes a six-step process for batch waste incineration:

Step 1 – Understand Your Waste Stream.

Step 2 – Select the Appropriate Incinerator (or Evaluate the Existing System).

Step 3 – Properly Equip and Install the Incinerator.

Step 4 – Operate the Incinerator for Optimum Combustion.

Step 5 – Safely Handle and Dispose of Incinerator Residues.

Step 6 – Maintain Records and Report.

The batch waste incineration document addresses proper system selection, operation, maintenance and record keeping, with the goals of achieving the Canada-Wide Standards for dioxins/furans and mercury, and reducing releases of other toxic substances.

The Environmental Guideline for the Burning and Incineration of Solid Waste produced by the Government of Nunavut provides guidance for incineration and ash disposition best management practices to reduce risk to the environment.

The Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities governs deposition of process residuals into municipal landfills in Nunavut, but it is expected that the TMAC Landfill Management Plan (when developed), will contain similar criteria to determine acceptable wastes for landfilling at Hope Bay, or for determining alternate disposition of incinerator bottom ash classified as a hazardous waste if sampling determines it contains pollutants of concern.

1.3. RELATED TMAC DOCUMENTS

The documents listed in Table 2 are expected to be referenced and utilized in conjunction with the Incinerator Management Plan.

Table 2 List of documents related to the Hope Bay Incinerator Management Plan

Document Title	Year	Relevance
Non-Hazardous Waste Management Plan (revision <i>in prep.</i> to include Landfill)	2012 (revision <i>in prep.</i>)	Describes management of non-hazardous solid waste segregated from the incinerator waste stream and disposal of incinerator ash.
Hazardous Waste Management Plan	2012 (revision <i>in prep.</i>)	Describes management of items such as batteries, aerosol containers and other materials not acceptable for incineration or landfilling.
Air Quality Management Plan	2015 (revision <i>in prep.</i>)	Describes the air quality monitoring programs associated with the Hope Bay Project, including stack testing of incinerators.
Safe Waste Incineration Standard Operating Procedure	2014	Describes safe work procedures for operation of incinerator units at Hope Bay.
Solid Waste Segregation, Handling and Disposal Standard Operating Procedure	2015	Outlines waste segregation required by all personnel working at Hope Bay and proper handling and disposal procedures.
Kitchen Food and Waste Handling Storage	2014	Describes proper handling and storage procedures of food wastes by all personnel at Hope Bay.

Incinerator Ash Sampling		Describes the procedure for collecting composite ash samples to be submitted for laboratory analysis.
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The Incinerator Management Plan is supported by a set of working procedures that provide detailed instructions on such topics as waste sorting, operation of specific models of incinerators in use, and ash sampling protocols. The procedures contain the various forms and checklists required to ensure the appropriate records are maintained concerning all incinerator operations.

1.4. PLAN MANAGEMENT

The Vice President of Operations (VPO) has the overall responsibility for implementing this management plan and will provide the on-site resources to operate, manage and maintain all incinerators located in the Hope Bay Belt in accordance with the operation manuals and regulatory requirements.

The Surface Manager is responsible for providing on-site support and resources for waste stream management and incineration of domestic waste, including monetary resources for completing maintenance and repairs.

The Site Services Supervisor is responsible for revising this management plan and will maintain waste incinerator records, conduct and record regular inspections of the incinerators, request maintenance or repairs and document completion of the request, provide feedback on operational procedures to improve performance, and will supervise the operation of the incinerators, including sampling and disposition of ash.

The Environmental Coordinator is responsible for supporting the Site Services Supervisor for revisions (where required) to this plan, coordinating ash characterization analyses to identify appropriate disposal options, conducting workplace inspections and performing regular audits of the waste management and incineration records.

1.5. PLAN IMPLEMENTATION

In accordance with the requirements of the General Conditions (Part B) of the applicable water licences, this plan will be implemented following its submission, subject to any modifications proposed by the NWB as a result of the review and approval process.

This plan will be periodically reviewed and updated as required as the Project moves through operations and final closure and reclamation.

Additionally, the detail in the document will continue to be refined with subsequent revisions.

2. INCINERATION MANAGEMENT ISSUES

Waste management at Hope Bay has made substantial advances and improvements since activity in the Project area started. Dedicated facilities allow for centralized collection, sorting and proper packaging for various forms of waste products. This may include on-site incineration or preparing waste for transport to a waste transfer station for further recycling, treatment or disposal. Any waste that meets the requirements for on-site incineration is burned on site. For more information regarding hazardous or non-hazardous waste management at Hope Bay refer to the following documents:

- Hope Bay Hazardous Waste Management Plan
- Hope Bay Interim Non-Hazardous Waste Management Plan
- Hope Bay Non Hazardous Waste and Landfill Management Plan (in prep. – currently the Interim Non-Hazardous Waste Management Plan)

Under no circumstances does TMAC allow personnel or contractors to burn hazardous waste. Hazardous waste and industrial waste are kept separate and temporarily stored according to regulations until shipped off site for disposal or recycling at approved facilities. Site incinerators are only approved to burn “domestic” camp waste such as kitchen waste, food scraps, camp room and restroom garbage, cardboard, paper and sewage sludge cake.

2.1. WASTE STREAM MANAGEMENT

The first steps to ensuring that effective and compliant incineration occurs is to ensure proper waste segregation so that inappropriate wastes do not make it into the waste stream destined for the incinerator and to understand the resulting composition of the wastes to be incinerated.

2.1.1. MANAGEMENT RESPONSE

2.1.1.1. WASTE STREAM COMPOSITION AND SEGREGATION

Only appropriate domestic camp waste is permitted for incineration. All wastes are segregated at the source to ensure non-burnable waste streams do not enter the feed stock for the incinerator. All “burnable” waste is placed in specifically identified waste containers with transparent bags and in bins located throughout the camp facilities. Prior to loading the waste batches in the incinerator, the feed material is visually inspected by the incinerator operator to ensure it does not contain inappropriate waste materials. General classes of inappropriate wastes include, but are not limited to:

- Hazardous Wastes
- Mercury-containing materials/waste (fluorescent lamps, thermometers, thermostats)
- Asbestos waste
- Liquid wastes including petroleum hydrocarbons and untreated liquid sewage (sewage sludge cake may be burned)
- Metal and glass
- Wastes containing mercury, pressure or chemically treated wood
- Uncontaminated plastics, including chlorinated plastics
- Bulky materials such as machinery parts or large metal goods such as appliances
- Radioactive materials such as smoke detectors
- Potentially explosive materials such as pressurized vessels, unused or ineffective explosives
- Hazardous materials such as organic chemicals (e.g. PCBs, pesticides)
- Electronics, batteries, fluorescent light bulbs, whole tires, rubber boots, etc.

When encountered, inappropriate waste material is removed from the incinerator feed, where possible. If the inappropriate waste is too intermixed with the incinerator feed, the bag will be rejected and not incinerated. Removed inappropriate wastes and rejected batches will be stored and handled in accordance with the Hazardous Waste Management Plan. The waste feed inspections shall be recorded on the appropriate forms, and issues with proper segregation and sorting at source in the waste management stream will be addressed by identifying the source or root cause of the issue, re-enforcing or improving training of site personnel, providing additional labelled receptacles, or implementing other measures as needed.

2.1.1.2. REDUCE, REUSE AND RECYCLE

TMAC has adopted the 3R's of waste management: Reduce, Reuse and Recycle. The objective of these activities is to divert as much material from becoming a waste (hazardous or otherwise) and therefore reduce the total volume of wastes requiring handling, storage, transportation and disposal. Some of the most significant actions in this regard include:

Reduce

- Purchasing only the required amounts of materials and buying in bulk when the opportunity is available.
- Employing inventory control methods in an attempt to ensure that quantities of materials are completely utilized.
- Establishing maintenance schedules that are consistent with the equipment manufacturers' suggested replacement.
- Maintaining and protecting materials to prevent damage and breakage.
- Eliminating unnecessary plastic and bulky packaging by buying kitchen supplies in bulk (i.e. ketchup, salad dressings, syrups, etc.).
- Cutting down on plastic food packaging.
- Substituting less hazardous chemicals where possible.
- Selecting products that provide the maximum "life-of-material".

Re-Use

- If appropriate, collect and return materials to the system (i.e. equipment, operations, etc.) following maintenance or repair.
- Waste oil burners will be used to heat selected facilities.
- Oil/water separators are used onsite to reduce the amount of contaminated water requiring shipment off site.
- If appropriate, filter and/or use additives to replenish lost properties of material in order to extend its useful life.
- Testing to ensure items (i.e. batteries) are "spent" before removing from service.

Recycle

- Commercial companies are used to the maximum extent practical to recycle appropriate materials on a fee for service basis.
- Explore waste management options that allow for the recycling of a material or product instead of disposal.

2.1.1.3. PREVENTION OF WILDLIFE ATTRACTION

TMAC is required by the Water Licence and Project Certificate to incinerate food wastes to prevent attraction of wildlife. A comprehensive program exists to educate site personnel on the importance of proper food waste (or other potential attractant) management to ensure animals are not attracted to worksites. All food waste is returned daily to the main camp facilities so it is captured in the domestic waste stream. Collection and transfer of food wastes is performed so that these attractants are stored safely, moved between facilities securely and are burned in the incinerator promptly.

2.1.1.4. TARGETING PRE-CURSOR TO THE FORMATION OF DIOXINS AND FURANS

Chlorine, in almost any form, is the key component required for dioxin and furan formation. Reducing or removing the chlorinated material that enters incinerators is the first minimization strategy to reduce the formation of dioxins and furans. Removing all chlorine compounds is extremely difficult because chlorine is used in the manufacture of a large variety of products, and in many cases there are no substitutes. Poly vinyl chloride (PVC) containing products are, however, eliminated from the incinerator waste stream to the extent possible. Sewage sludge also generally contains chlorinated compounds. TMAC may incinerate adequately dried sewage sludge or alternatively store this material in biodegradable bags (in a secure location not accessible to wildlife) until it can be buried in the overburden stockpile or beneath tailings in the Tailings Impoundment Area.

The following components of the waste stream must be removed before incineration to reduce the presence of potential catalysts and to reduce the presence of materials that may form or act as precursors for the formation of dioxins and furans:

- **Metals:** The inorganic component of the waste is largely made of metal-containing materials. During combustion, it is possible for these metals to become catalysts for the formation of dioxins and furans and it is, therefore, important that metal be eliminated from the waste stream destined for incineration. The metals include foils, batteries, nails and screws, painted wood products, aerosol cans, etc.
- **Plastic:** Plastics, particularly PVC, must be eliminated from the incinerator waste stream to the extent possible. The chlorine compounds contained in PVC and plastics are an ideal building block for the formation of dioxins and furans.
- **Medical Waste:** Medical waste can potentially be the biggest source of dioxin- and furan-forming material. Medical waste contains a mix of sharps made of metal, plastics (frequently PVC) and organic material which frequently contain chlorine compounds. This is an ideal mix for forming dioxins and furans. TMAC avoids incinerating these materials to the extent possible by segregating them from the incinerator waste stream.

By following these waste separation guidelines the extent of dioxin and furan formation will be reduced.

2.1.2. MANAGEMENT RESPONSE

TMAC's current waste segregation practices greatly reduce the volume of plastics, metals, glass, and other potential catalysts for dioxin and furan formation from ending up in the incinerator waste stream.

Containers are set up throughout camp buildings to collect batteries, aerosol cans, food cans and glass containers, domestic plastic containers (toiletries, etc.), refundable cans/bottles and medical wastes. Separate labelled waste containers are available for plastic construction debris, cardboard, non-burnable wood and rags/absorbent pads. All kitchen grease is securely stored for offsite disposal and does not enter the incinerator waste stream.

2.2. DIOXIN AND FURAN EMISSIONS

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, respectively, are predominantly a result of human activity. These substances are toxic, persistent, and bio-accumulative. Due to their extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination.

Dioxin and furan contamination found in soil, water, sediments, and tissues are the subject of national guidelines for dioxins and furans. The CWS Dioxin/Furan guideline for incineration is 80 pg I-TEQ/m³, where pg = picogram, I-TEQ = international toxic equivalent, m³ = cubic metre.

The exact mechanism of dioxin and furan formation in incinerators is poorly understood, but generally they form during the thermal breakdown of organic materials in the presence of transition metals and chlorinated compounds. Dioxin formation takes place as the flue gas cools from the initial 1000°C to about 250°C, with peak dioxin and furan formation occurring in the range of 650°C to 250°C.

Regardless of how dioxins and furans are formed, certain operating conditions increase the potential for formation of these compounds including;

- a) Incomplete combustion of fuel
- b) An oxidizing atmosphere
- c) Presence of a chlorine source
- d) Fly ash surfaces (carbon source)
- e) Fly ash with degenerated graphite structures
- f) Presence of catalytic metals (copper, iron, manganese, zinc, etc.)

2.2.1. MANAGEMENT RESPONSE

Dioxin and furan emissions from incinerators may be reduced by:

- o Reducing or removing certain waste types from the incinerator waste stream as described above through appropriate waste sorting techniques;
- o Placement of waste in the incinerator chamber and operating the incinerator according to manufacturer specifications to ensure optimal burning efficiency and provide adequate destruction of dioxins and furans;
- o Use of Pre-Operational, Operational and Maintenance Checklists and Log Books to ensure that the unit is operated in a safe and efficient manner.

TMAC has selected and will continue to select incinerator technology that should reduce the extent to which dioxins and furans can form. This is achieved through the following mechanisms:

- o Use of dual or secondary chamber incinerator technology with a clear burn process defined which eliminates spurious burn conditions and operator error.
- o Operating each incinerator unit within the manufacturer specifications to achieve adequate temperatures and residence time. This should allow the materials to be combusted completely so that no precursors are available for dioxin and furan formation during cooling.

2.3. MERCURY EMISSIONS

Waste incineration has historically been responsible for a portion of the mercury emitted in Canada; however reductions in emissions have been apparent nationwide since the implementation of the CWS

and the requirement to monitor specific emissions. Improved exhaust gas controls can reduce emissions of acid gases and fine particulates in addition to new activated carbon injection systems that decrease emissions of mercury and dioxins and furans.

At the same time, action has been taken by many product manufacturers to reduce the mercury content of consumer goods which could end their life cycle in domestic solid waste (e.g., alkaline batteries) and thus have reduced the mercury available in the waste stream.

Emission limits are expressed as the concentrations of specific compounds and elements present in the exhaust gas exiting the stack of the facility. New or expanding facilities are expected to comply with the standard upon attaining normal full scale operation, while the limits for existing facilities are capable of being met using generally available technology (or waste diversion). Larger facilities are subject to annual stack testing to verify compliance with the limit. Mercury emission limits are presented in Table 3.

Table 3 Canada-Wide Standard for Mercury Emissions

Source	Mercury Standard
Municipal waste incineration	20 µg/Rm ³
Hazardous waste incineration	50 µg/Rm ³
Sewage sludge incineration	70 µg/Rm ³
Medical waste incineration	20 µg/Rm ³

µg = microgram, Rm³ = reference cubic metre

2.3.1. MANAGEMENT RESPONSE

TMAC disposes of any waste stream that may contain mercury, including thermostats, thermometers, light bulbs, etc., at an off-site facility. These items are placed in labelled collection containers located throughout the camp and facility. Waste management employees screen for all possible mercury contaminated waste and ensure all relevant regulations are adhered to regarding handling, storage and transport for offsite disposal. For more information regarding the regulations and waste shipment procedures please refer to the Hope Bay Hazardous Waste Management Plan.

2.4. INCINERATOR CAPACITY AND OPERATIONS

Incinerator capacity has been selected to ensure timely and effective management of the volumes of burnable domestic waste generated at Hope Bay. Incinerator details, including model, capacity, location, status and reference to operating details and manuals are provided in the site-specific modules appended to this plan.

2.4.1. MANAGEMENT RESPONSE

The Hope Bay site waste management facilities are closely supervised and waste management personnel are present to monitor incinerator burns and document burn conditions and other relevant information. Incinerator units may be enclosed within shelters to ensure efficiency of the burn process is optimized.

Employees are trained prior to commencement of work so that they are aware of the operational procedure and capacity of the incinerator, and health and safety risks associated with the incinerator and its operation.

2.4.1.1. BURN PROCESS OPERATIONAL OVERVIEW

Batch waste incineration is a process that occurs through charging the incinerator unit with a discrete load or quantity, and allowing a complete burn cycle to finish before the next load is burned. This process is critical to the efficiency of the burn. Standard operating procedures outline the process to prepare and properly load each incinerator in accordance with manufacturer instructions to optimize burn efficiency.

2.4.1.2. BATCH PREPARATION OF WASTE

Using categories defined by the supplier of the incinerator, the approximate waste composition of a batch is determined for each incinerator model used. Understanding the typical waste stream composition is important as it leads to key opportunities for waste management generally and specifically for incineration control on site. Periodic audits of the waste stream using incinerator logs and operational checklists will guide continuous improvement of batch preparation processes.

Daily record keeping and operator experience will assist in ensuring batches are prepared consistently and within the capacity of the specific incinerator unit. The weight of the various waste categories loaded into the incinerator determine the proper batch composition for efficient burn cycles.

An appropriate load composition would roughly be represented by:

55% Food Waste / 23% Paper or Cardboard Waste / 22% Other (Sewage Sludge Cake, other domestic)

2.4.1.3. HEALTH AND SAFETY

All incinerators at Hope Bay will be operated in accordance with the manufacturer's instructions. All operators will have appropriate training before being tasked with operating any unit or handling waste and will include the identification of any potential hazards that could be encountered while performing these tasks. Standard operating procedures outline the appropriate personal protective equipment that is required by all personnel operating the incinerator system.

2.4.1.4. TRAINING

Personnel with the responsibility of operating incinerators at Hope Bay will be required to read and comprehend this Incinerator Management Plan, the Operating and Maintenance Manual(s) relevant to the unit they will be operating, and any Standard Operating Procedures that support this Plan or provide site-specific information required for safe and effective incinerator operations.

In addition, an on-site training program will be provided to cover all aspects of incinerator management including: equipment pre-checks, operation, maintenance, monitoring, and record keeping. The training also includes identification of activity related risks, knowledge and use of job-specific PPE, as well as proper handling, storage, and disposal of all ash generated from the facility. A supervised competency evaluation is conducted for all trainees.

The training is both job-specific and equipment-specific and is provided to any site personnel assigned the responsibility to oversee, inspect, maintain, or monitor the incinerator.

2.5. ASH MANAGEMENT

Bottom ash in the incinerator can contain pollutants of concern including mercury, lead and cadmium. These residuals in the ash can be reduced to acceptable levels with proper segregation of non-burnable items from the incinerator feed stock and through maximizing efficient burn practices. The

Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities published by the Government of Nunavut in 2011 establishes the criteria for determining whether the bottom ash from open burning or incineration is appropriate for disposal in a landfill.

2.5.1. MANAGEMENT RESPONSE

The incinerator ash sampling program established for Hope Bay will determine the proper disposition of bottom ash. Once the combustion chamber of the incinerator is cool, the incinerator operator will remove the ash from the previous burn cycle before reloading the incinerator. During ash removal, the operator will inspect and clean the combustion air holes, inspect the burner tip for damage, and will also collect ash samples for analysis.

The remaining ash is placed into metal containers to be weighed. Once weighed and documented, these contents are then transferred into a labelled drum. When full, this drum is sealed and stored to await results of the ash sampling.

A composite sample of ash is sent to an external laboratory for analysis of:

- Leachable metals
- Leachable mercury
- Leachable benzene, toluene, xylenes, and ethylbenzene
- Paint filter
- Flash point

The details of this sampling program can be found in standard operating procedures for ash sampling for the site incinerators and burn pan. Results of the sampling will determine if the ash can be disposed of as non-hazardous waste (landfilled) or must be treated as hazardous waste and managed in accordance with the site Hazardous Waste Management Plan. Ash sampling analysis records are maintained on site, and may be conveyed offsite to receivers of ash shipments if warranted. Hazardous waste shipments will follow the Transportation of Dangerous Goods (TDG) regulations as well as the Interprovincial Movements of Hazardous Waste regulations. The Waste Management Facility maintains a tracking report of all ash shipped from Hope Bay. Certificates of Disposal for waste shipped off site are provided by the off-site waste handling facility. This is provided so waste generators can demonstrate to regulatory authorities that their waste is being handled by an approved facility and that the waste was disposed according to applicable federal and territorial regulations.

2.6. FUEL STORAGE

Incinerator units are supplied by dedicated diesel fuel tanks.

2.6.1. MANAGEMENT RESPONSE

The fuel storage, secondary containment and fuel delivery lines are subject to regular inspection. There are also spill kits available nearby in the event of a spill or leaking fuel line.

3. MONITORING AND EVALUATION

3.1. INSPECTIONS

Routine inspections of the incinerator and associated facilities will be conducted by a qualified individual prior to every use of the incinerator as per stand operating procedures.

Detailed standard operating procedures for each type of incinerator unit contain the specific inspection checklists that are utilized. All raw data records from the operation of the incinerator will be retained for inspection by the appropriate authorities.

3.2. MONITORING

3.2.1. INCINERATOR STACK TESTING

A monitoring program has been implemented for the operation of site incinerators. A third-party service provider is used for monitoring emissions when the stack testing requirement is triggered. The requirement for stack testing is outlined in the CWS for dioxins and furans and the CWS for Mercury, with triggers related to operational state, volumes and types of wastes burned. The testing will be conducted when the thresholds for monitoring are met, unless otherwise approved by Environment Canada.

The following parameters are required to be monitored based on the CWSs;

- Dioxin
- Furan
- Mercury

Results of sampling are reported annually to the NWB and the Nunavut Impact Review Board (NIRB), and emissions data is used for calculating and reporting non-fugitive (point source) emissions to the National Pollutant Release Inventory (NPRI).

3.3. DOCUMENTATION AND REPORTING

TMAC maintains detailed records for the operation of the incinerator. Records will be kept on file for each burn and will be available for audit by TMAC management or regulatory agency representatives. Any out-of-specification situations will be raised immediately and the incinerator should not be used until maintenance or remedial measures have been applied.

To demonstrate appropriate operation and maintenance of the incinerator, the facility will maintain records containing, at minimum, the following information:

- A list of all staff who have been trained to operate the incinerator; type of training conducted and by whom; dates of the training; dates of the refresher courses.
- All preventative maintenance activities undertaken on the equipment.
- Records of operation of the incinerator.
- Records of quantities and types of waste incinerated.
- Summarized annual auxiliary fuel usage.

- The quantity and disposal location of incinerator residual ash.
- Results of any stack emission monitoring and ash sampling information.

Monthly Waste Summary

A monthly summary tracks incinerator burns per day, the weight and type of waste prior to the burn and the amount of ash produced. Notes from daily operations are included in this summary. A chart is produced that compares the volume of waste burned to the amount of ash produced. This information is used to determine any trends apparent in the incineration process and identify opportunities where improvements could be implemented. The summary of waste burned during the calendar year is also used for calculations and reporting to the NPRI, by July 1 each following year.

4. CONTINGENCIES

A back-up unit is available in the event that an incinerator malfunctions or is taken out of service for maintenance. This redundancy ensures there is limited interruption to management of the incinerator waste stream, and reduces the possibility that stockpiling of any burnable domestic waste is required. In the event that temporary stockpiling is required, all food waste is packaged and stored securely from access by wildlife until functioning of the incinerator can resume.

5. REFERENCES

- Health Canada. 2005. Dioxins and Furans
- Canadian Council of Ministers of the Environment (CCME). 2006. 2006 Review Update for Dioxins and Furans Canada Wide Standards.
- CCME. 2001. Canada Wide Standards for Dioxins and Furans.
- CCME. 2000. Canada Wide Standards for Mercury Emissions.
- Environment Canada. 2010. Technical Document for Batch Waste Incineration.
- Government of Canada. 1999. Canadian Environmental Protection Act (CEPA)
- Government of Canada. 1995. Federal Toxic Substances Management Policy (TSMP)
- Government of Nunavut. 2012. Environmental Guideline for the Burning and Incineration of Solid Waste
- CCME. 1998. Policy for the Management of Toxic Substances
- Westland Consulting. 2011. Incinerator General Operational Plan and Standard Operating Procedure
- Westland Consulting. 2009. Forced Air Incineration Systems Operating and Maintenance Manual
- Westland Consulting. No date. Maintenance Operating Specification and Technical Data for CY2020FA



INCINERATOR MANAGEMENT PLAN

MODULE A: 2AM-DOH1323 (DORIS)

CONFORMITY TABLE

Licence	Part	Item	Topic	Report Section
2AM-DOH1323	G	5	The Licensee shall dispose of all food waste in an incinerator designed for this purpose and meets the requirements of the Canada-Wide Standards for Dioxins and Furans and Canada-Wide Standards for Mercury emissions or other standards as they become available.	Main Document Section 2.1.3 and 3.2.1
	G	6	The Licensee shall not open burn plastics, wood treated with preservatives, electric wire, Styrofoam, asbestos or painted wood to prevent the deposition of waste materials of incomplete combustion and/or leachate from contaminated ash residual, from impacting any surrounding waters, unless otherwise approved by the Board in writing	Main Document Section 2.1.1 and 2.5
	G	7	The Board has approved, with the issuance of the Licence, the Hope Bay Mining Ltd., Incinerator Management Plan, March 2012 (Rev 1.1). The Licensee shall, three (3) months prior to Operations, revise and submit to the Board for review, in writing, an updated Incineration Management Plan, prepared in conjunction with Part G, Item 8, with respect to the Landfill Management Plan.	Main Document and this Module
	G	8	The Licensee shall submit to the Board for approval in writing, six (6) months prior to use of the Landfill, a revised Landfill Management Plan. The Plan shall consider the following: parts a through j as applicable (see list)	Main Document – multiple sections for items a) through h) and j)
	Schedule B	12	Annual Incineration stack testing results	Main Document Section 3.2.1

A1. INTRODUCTION

The Type A Water Licence No. 2AM-DOH1323 issued to TMAC by the Nunavut Water Board (NWB) allows the incineration of approved waste streams.

TMAC is required, under Part G of the Licence, to submit to the NWB an Incineration Management Plan (Item 5) in conjunction with a revised Landfill Management Plan (Item 9). The Incineration Management Plan, as defined in the Licence shall consider the following:

- a. Recycling/segregation waste program.
- b. Incineration technology selected.
- c. Waste audit (amount and types of wastes to be incinerated or otherwise disposed).
- d. Consolidation of wastes.
- e. Operational and maintenance records.
- f. Operator training.
- g. Emission measurements.
- h. Incinerator ash disposal.
- i. Consideration for disposal of used oil and waste fuel.
- j. Monitoring, characterization and disposal of incinerator ash.

The Incinerator Management Plan has been prepared and is being submitted by TMAC to address the requirement specified in Part G, Item 5 of the 2AM-DOH1323 Water Licence, and also includes the plan for incineration throughout the Hope Bay belt. The plan addresses all relevant aspects of waste stream management, and the operation, maintenance and monitoring of incinerator units used to burn permitted wastes. The plan includes the management and disposal of all residual ash waste generated by the operation of the incinerator.

A1.1 BACKGROUND

A1.1.1 Overview of Doris Incineration Compliance

Domestic waste incineration at Doris North, under the prior project owner, was demonstrated to comply with the relevant Canada-wide Standards for incinerator emissions, through effective waste segregation and efficient burn practices. It is the aim of TMAC to continue implementing the practices that reduce the probability of formation of pollutant compounds during waste incineration.

A2. INCINERATOR MANAGEMENT AT DORIS

Two incinerators for the Doris North project are currently located at the Roberts Bay laydown waste management facility; one incinerator is a contingency unit and will be used in the event that the main unit requires maintenance or repair. Both incinerator units are CY-2050-A-FA models with a capacity of burning 75 kg of waste per hour. The operating manual for these units is provided in Appendix A of this module.

Waste management at Doris North involves comprehensive sort-at-source and segregation of domestic wastes generated at the Doris Camp, return of all food waste attractants from remote worksites to the Doris Camp domestic waste stream, and collection of wastes for transfer to the centralized waste management area at Roberts Bay for timely incineration.

A3. MONITORING AND EVALUATION

TMAC is required to report the results of Annual Incinerator Stack Testing in the 2AM-DOH1323 Licence Annual Report by March 31 of each year. A third-party consultant is contracted to conduct the test, and their report is forwarded to the NWB and NIRB; in addition the results are summarized in annual reporting to those agencies.

Bottom ash for incinerators located at Doris Camp is sampled as outlined in Section 2.5.1 of the main body of this Incinerator Management Plan.

Records of materials deposited to the landfill (when constructed), including qualifying incinerator ash, will be reported annually to the NWB per the relevant requirements of the Licence.

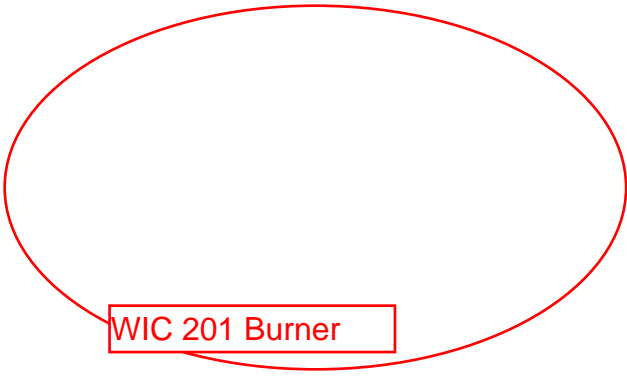


INCINERATOR MANAGEMENT PLAN

MODULE A 2AM-DOH1323 (DORIS)

**MODULE A - APPENDIX A: OPERATING AND
MAINTENANCE MANUAL**

CY-2050-A-FA



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.

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.

NOTICE

Intended to bring special attention to information, but not related to personal injury or property damage.

General Information

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 & certified to CSA B140.0. Model SF - UL listed to comply with ANSI/UL296 & certified to CSA B140.0.
Fuels	U. S: No.1 or No.2 heating oil only (ASTM D396) Canada: No. 1 stove oil or No. 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)	Height12.5 inches Width15 inches Depth 8.50 inches Air tube diameter 4.00 inches
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

- For recommended installation practice in Canada, refer to the latest version of CSA Standard B139 & B140.
- 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.



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.

Table 2 – Air Tube Combination (ATC) codes

Firing Rate (gph)	Head	Static plate size	ATC Codes for usable air tube lengths ('A' in inches; See Figure 3.)			
(min-max)		(inches)	6-5/8	9	13	16
For 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
For 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

Inspect/Prepare Installation Site

• Chimney or vent

- Inspect the chimney or vent, making sure it is properly sized and in good condition for use.
- 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



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.

See NFPA 31 Standard for complete details.

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.

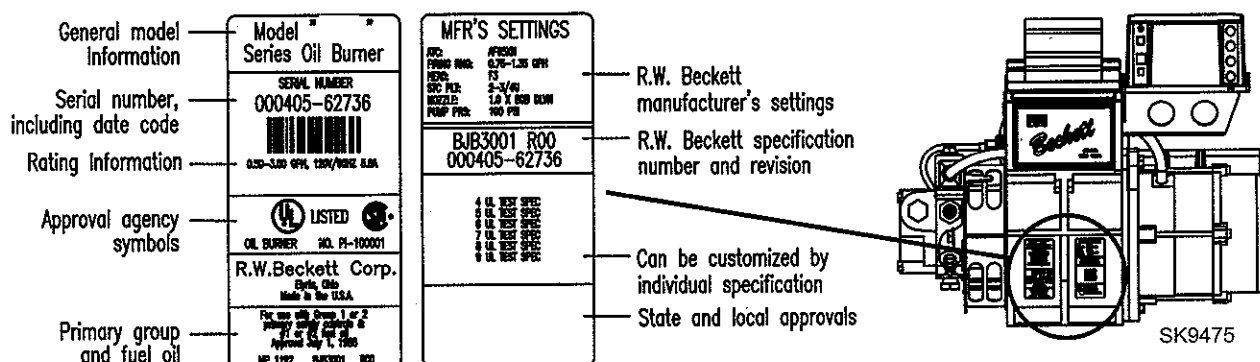
• Combustion chamber — Burner retrofitting

Verify that the appliance combustion chamber provides at least the minimum dimensions given in Table 3.

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

Figure 1. Burner Label Location



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 "Connect fuel lines" later in this manual.

• 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 3 for details.

• Install burner nozzle (if not already installed)

1. Remove the plastic plug protecting the nozzle adapter threads
2. Place a $\frac{3}{4}$ " open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and finger tighten. Finish tightening with a $\frac{5}{16}$ " open-end wrench. Use care to avoid bending the electrodes.

WARNING Correct Nozzle and Flow Rate Required

Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, soot-ing, 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 5.

Table 5. 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 6. Nozzle Spray Angles

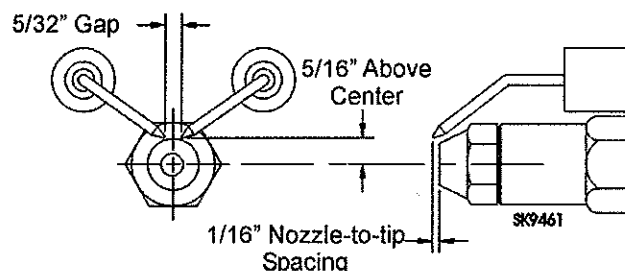
Recommended nozzle spray angles	
"F" head	70°, 80° or 90° nozzle

Note: Always follow the appliance manufacturer's nozzle specification, when available.

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 2.
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 6 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.

• Check/adjust electrodes

Figure 2. – Electrode Tip Adjustment



Check the electrode tip settings. Adjust if necessary to comply with the dimensions shown in Figure 2. 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.

Mount Burner on Appliance

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.

• Mounting options

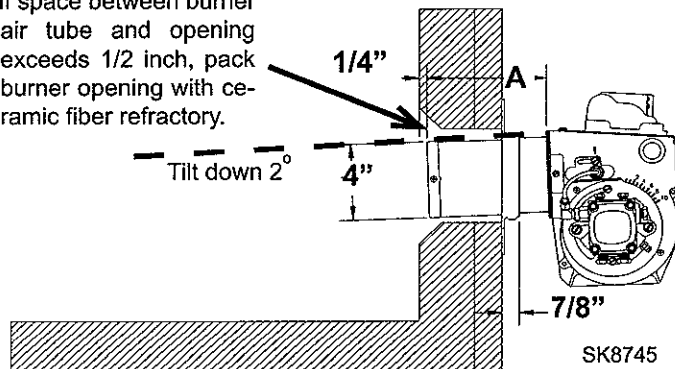
Bolt the burner to the appliance using the factory-mounted flange or an adjustable flange.

• 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 3.
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 3. – Mounting Burner in Appliance

If space between burner air tube and opening exceeds 1/2 inch, pack burner opening with ceramic fiber refractory.



• Connect fuel lines

Carefully follow the fuel unit manufacturer's literature and the latest edition of NFPA 31 for oil supply system specifications.

WARNING Do Not Install By-pass Plug with 1-Pipe System

Failure to comply could cause Immediate pump seal failure, pressurized oil leakage and the potential for a fire and injury hazard.

- The burner is shipped without the by-pass plug installed. **EXCEPTION:** Unless specified by the equipment manufacturer and noted on the label at top of pump cover.
- Install the by-pass plug in two-pipe oil supply systems **ONLY**.

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 anti-siphon valve in the oil supply line or a solenoid valve (RWB Part # 2182602U or 2233U) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

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.

Check/Adjust 'Z' Dimension for 'F' Heads

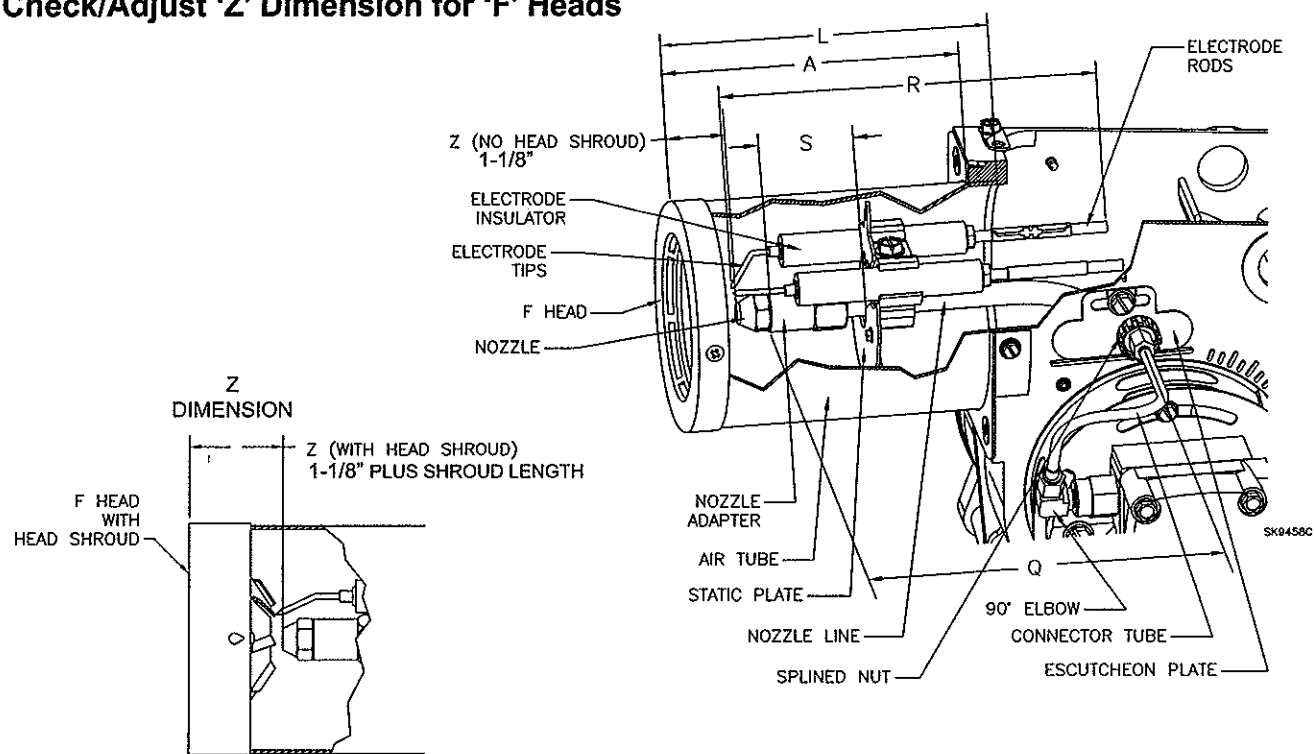


Figure 4. 'F' Head

• Check/Adjust 'Z' Dimension - '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 $1\frac{1}{8}$ " ($1\frac{3}{8}$ " 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 $1\frac{1}{8}$ " ($1\frac{1}{8}$ " 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+1/2
R (electrode length), $\pm 1/4$	A+2-1/4
S (adapter to static plate), $\pm 1/16$	(Note 1)
Q (nozzle line length),	A+ 15/16
Z (F head w/o head shroud)	1-1/8
Z (F head-with head shroud)	1-1/8 + shroud length. (Note 2)

Note 1: $1\frac{3}{8}$ for dimension A less than 4"; $1\frac{5}{8}$ for dimension A from 4" through 4-1/2", $2\frac{13}{32}$ for dimension A greater than 4-1/2".

Note 2: When using a straight edge.

Fuel line installation –

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 of Teflon tape will void the Suntec warranty.
- Use oil-resistant pipe sealant compounds.

Continuous lengths of heavy wall 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 fusible-handle design shut-off 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.
- 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

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)

• Burner packaged with appliance

Refer to appliance manufacturer's wiring diagram for electrical connections.

• Burner installed at jobsite

Refer to Figure 5, for typical burner wiring, showing cad cell primary controls. Burner wiring may vary, depending on primary control actually used.

The R7184 primary control with valve-on delay (prepurge) and burner motor-off delay (postpurge), requires 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.

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.

Typical Burner Wiring & Burner Sequence of Operation for R7184 Control.

Refer to the appliance manufacturer's wiring diagram for actual specifications.

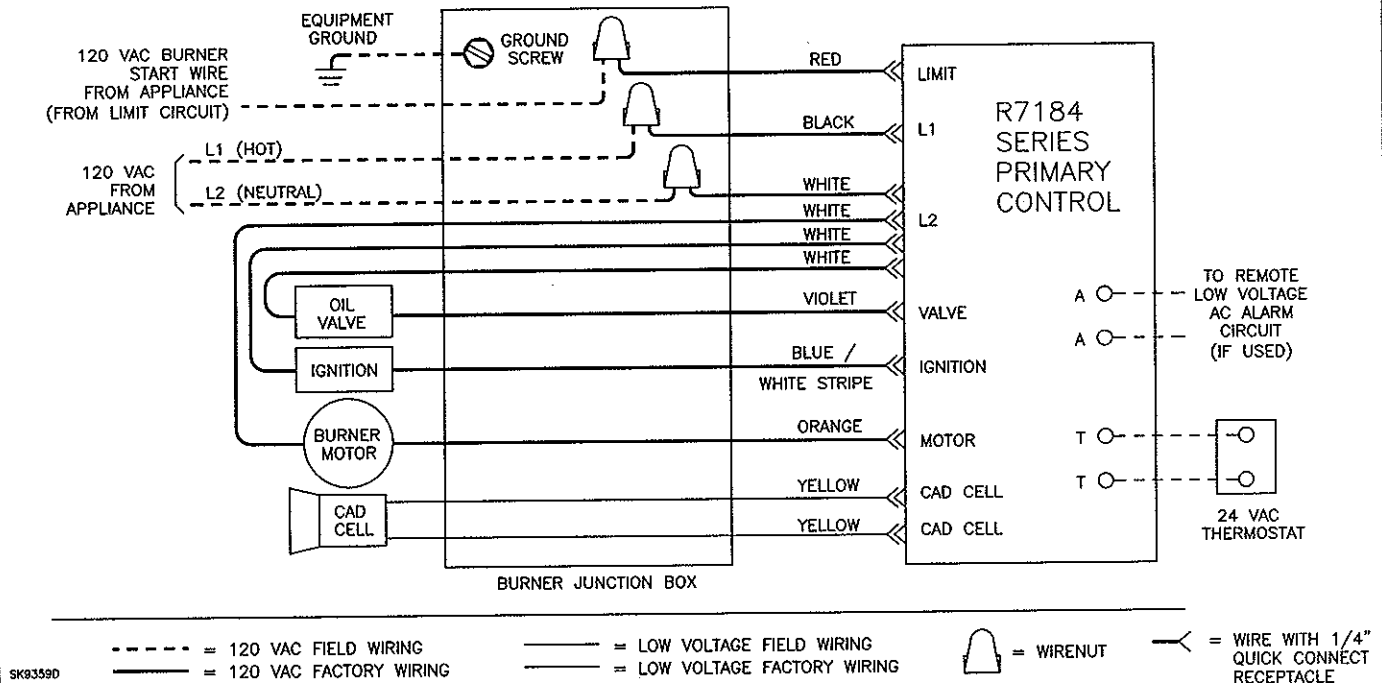
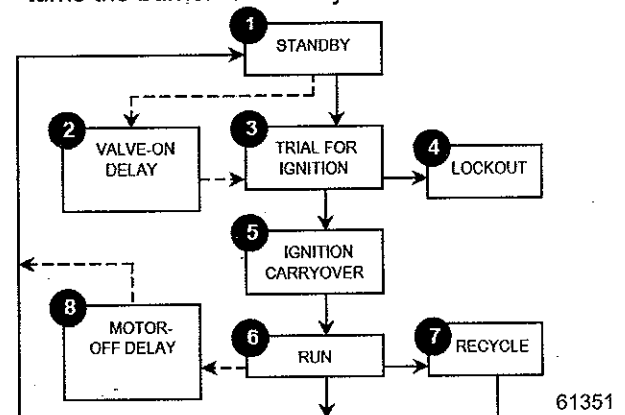


Figure 5. – Typical Burner Wiring

- 1. STANDBY.** The burner is idle, waiting for a call for heat. When a call for heat is initiated, there is a 3-10 second delay while the control performs a safe start check.
- 2. VALVE-ON DELAY.** The ignition and motor are turned on for a 15 second valve-on delay.
- 3. TRIAL FOR IGNITION (TFI).** The fuel valve is opened. A flame should be established within the 15 second lockout time.
- 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.
- 5. IGNITION CARRYOVER.** Once flame is established, the ignition remains on for 10 seconds to ensure flame stability before turning off. If the control is wired for intermittent duty ignition, the ignition unit stays on the entire time the motor is running.
- 6. RUN.** The burner runs until the call for heat is satisfied. The burner is then sent to burner 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 then repeats the above ignition sequence. If flame is lost three times in a row, the control locks out to prevent cycling with repetitious flame loss due to poor combustion.
- 8. BURNER MOTOR-OFF DELAY.** The fuel valve is closed and the burner motor is kept on for the selected motor-off delay time before the control returns the burner to standby.



Control System Features

Feature	Interrupted ignition	Limited reset, Limited recycle	Diagnostic LED, cad cell indicator	Valve-on delay	Burner motor off delay	Alarm Contacts
R7184A	YES	YES	YES	—	—	—
R7184B	YES	YES	YES	YES	—	—
R7184P	YES	YES	YES	YES	YES	Optional

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 R7184 primary controls, see Technician's Quick Reference Guide, part number 61351 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

• Set combustion with instruments

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 CO₂ (or O₂) . This is the vital reference point for further adjustments. Example: 13.5% CO₂ (2.6% O₂)
 - Step 3:** Increase the air to reduce the CO₂ by 1.5 to 2 percentage points. (O₂ will be increased by approximately 2.0 to 2.7 percentage points.) Example: Reduce CO₂ from 13.5% to 11.5% (2.6% to 5.3% O₂).
 - 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 CO₂ 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



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.

- ☐ 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.

• 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.

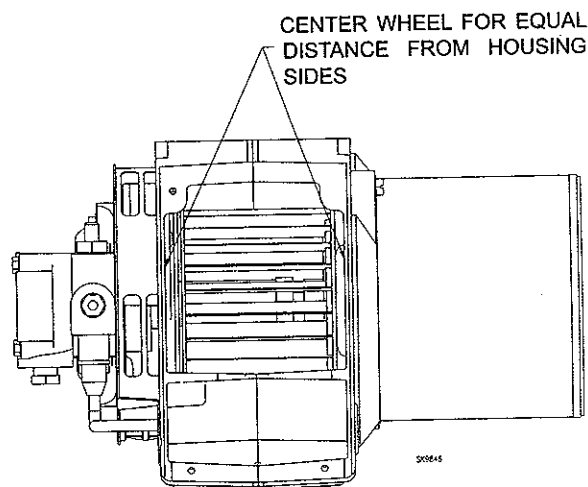


Figure 6. Blower Wheel Assembly



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
Not Shown	3416	Air Tube Gasket
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'
10	2184404U 2460	Fuel Units SM only CleanCut Single-Stage 'A'
12	2256	Pump outlet fitting
	482	Pump holding screws (not shown)
13	5394	Connector tube assembly, pump to nozzle line

#	Part No.	Description
14	51824U	Igniter and Base Plate
14	2289U	Ignition Transformer (10,000 V/23mA)
15	7455U	R7184A - Interrupted Ignition
	7456U	R7184B - Pre-purge
	7457U	R7184P - Pre and Post-purge
	7458U	R7184P w/ Alarm Contacts
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.

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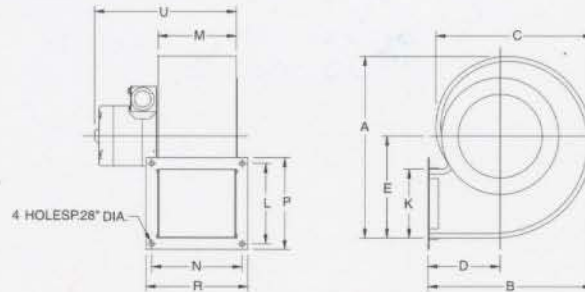
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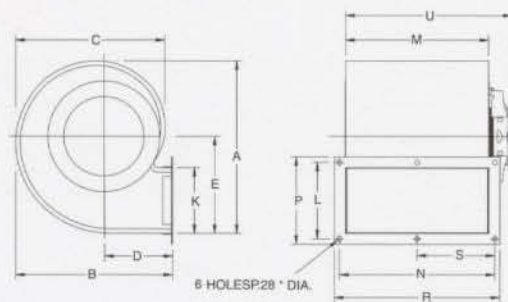
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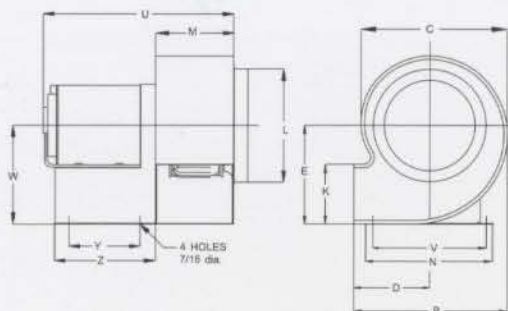
Specification Charts



Description	A	B	C	D	E	K	L	M	N	P	R	S	U	Weight (lbs)
AMU 265	9.93	9.0	8.46	3.9	5.55	3.75	4.37	4.22	4.87	5.0	5.5	-	7.65	8.05

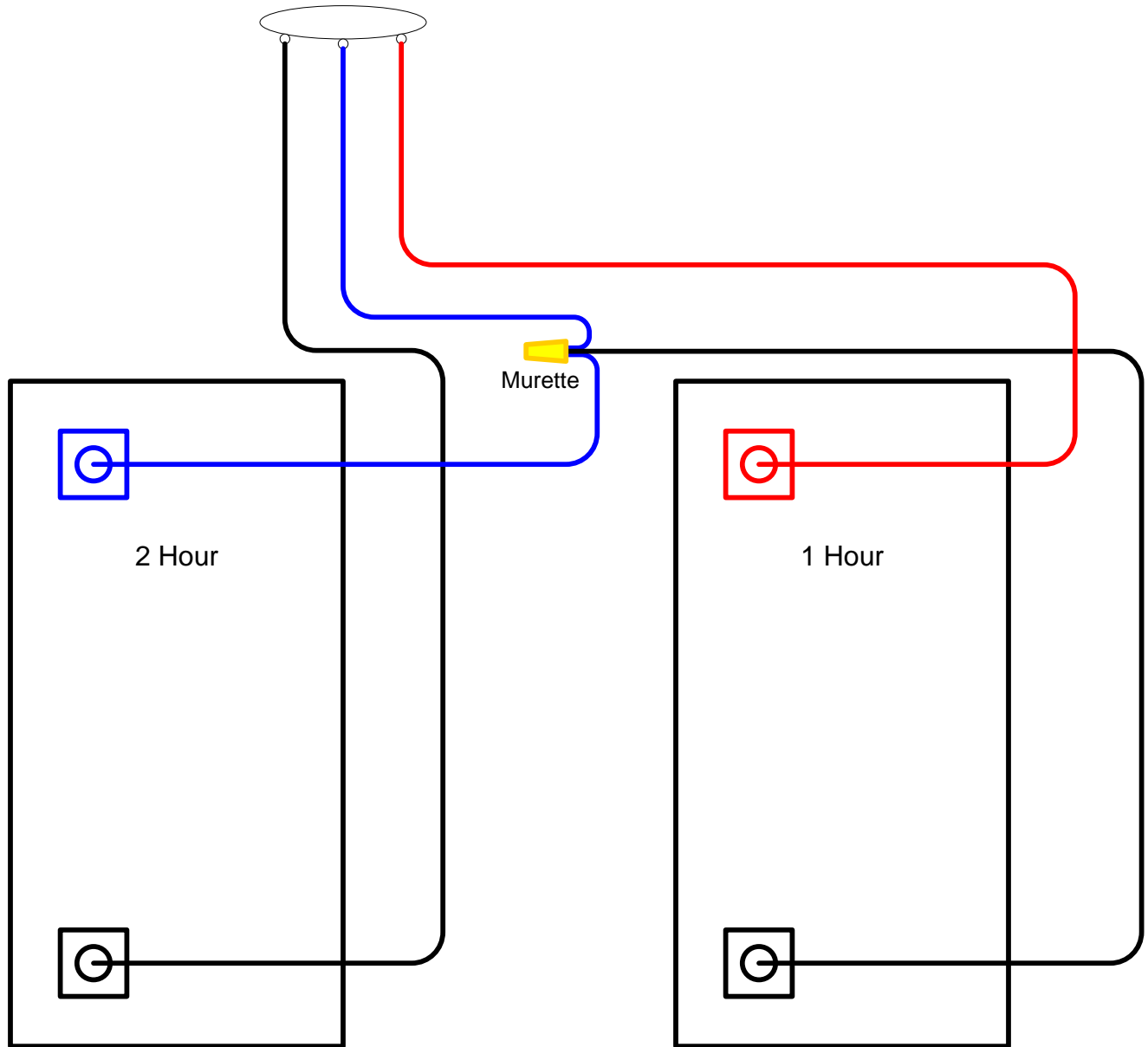


Description	A	B	C	D	E	K	L	M	N	P	R	S	U	Weight (lbs)
AMU 465	9.93	9.0	8.46	3.9	5.55	3.75	4.37	8.12	8.82	5.0	9.4	4.41	9.46	11.0

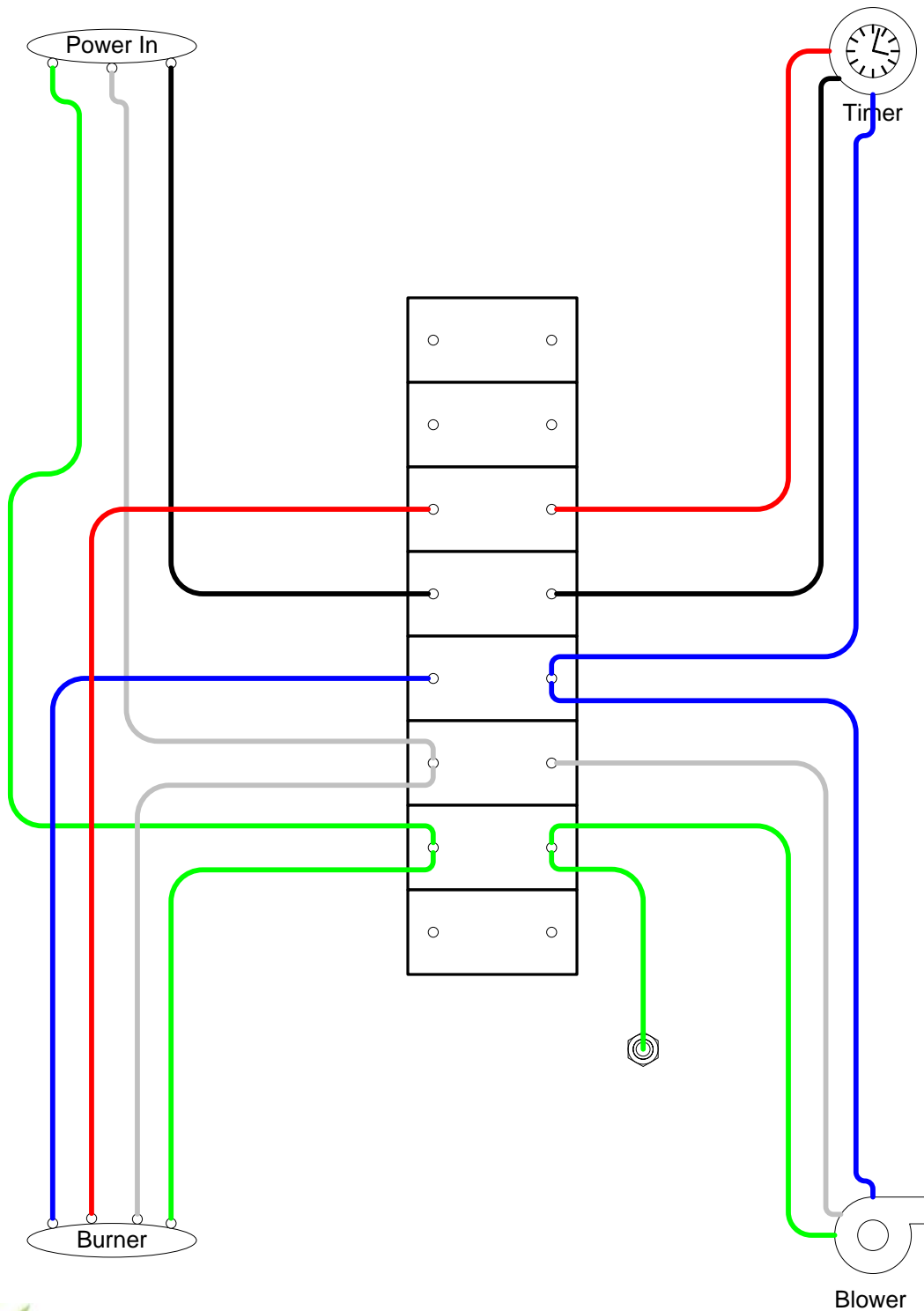


Description	A	B	C	D	E	K	L	M	N	U	V	W	Y	Z	Weight (lbs)
AMU 525	11.91	10.85	10.36	4.88	6.98	4.24	8.0	5.5	9.0	13.6	8.0	7.23	5.0	7.02	24
AMU 625	11.91	10.85	10.36	4.88	6.98	4.24	8.0	6.0	9.0	14.1	8.0	7.23	5.0	7.02	24
AMU 845	13.43	12.19	11.66	5.44	7.60	4.76	8.0	6.0	9.0	14.8	8.0	7.85	5.0	7.02	30
AMU 1100	16.58	14.62	14.06	6.34	9.51	6.28	9.0	7.0	9.0	16.6	8.0	9.81	5.0	7.02	53

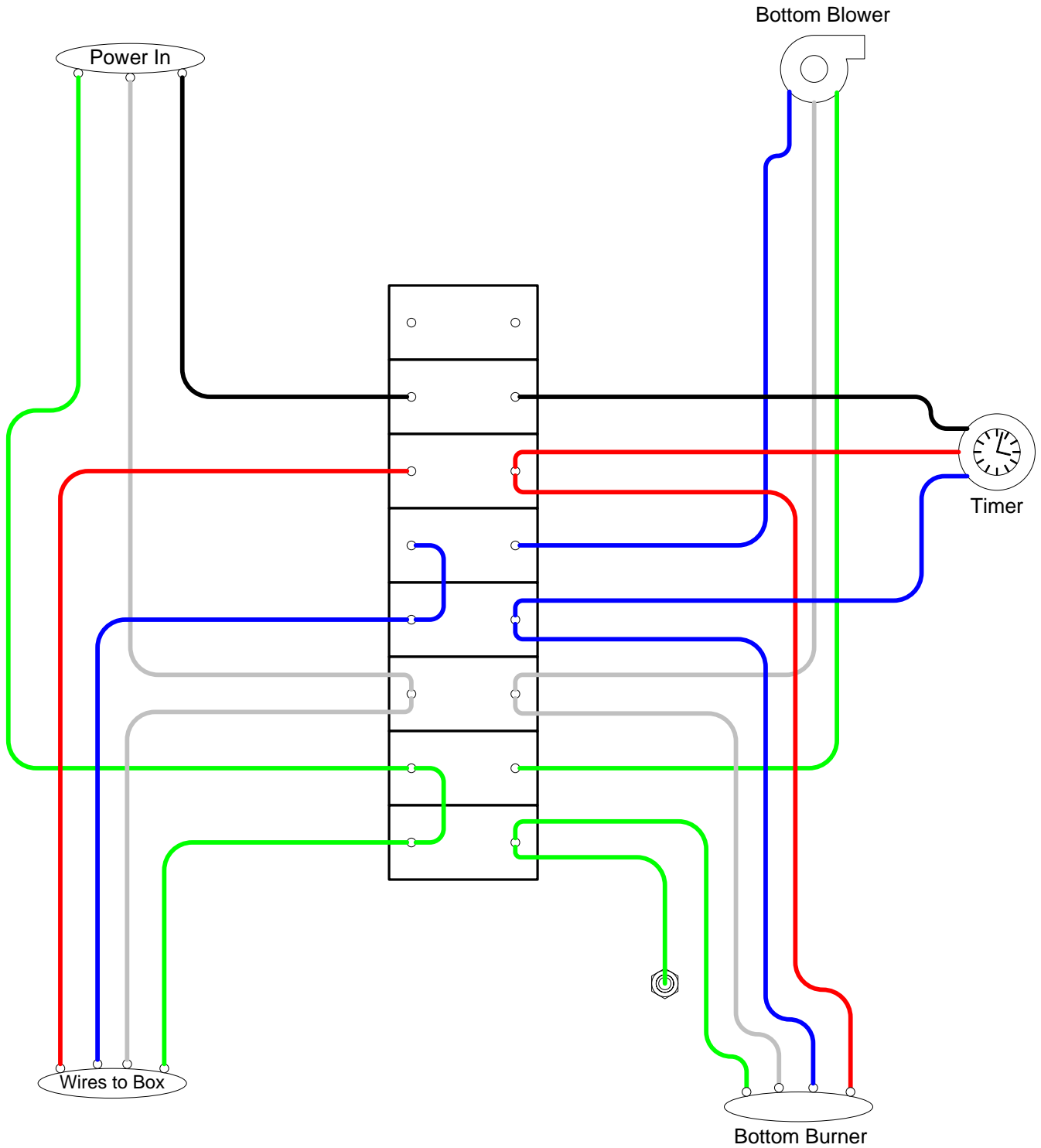
Cyclonator Timers
Wiring
CY-1020/1050 FA"D"
CY-2020/2050 FA"D"



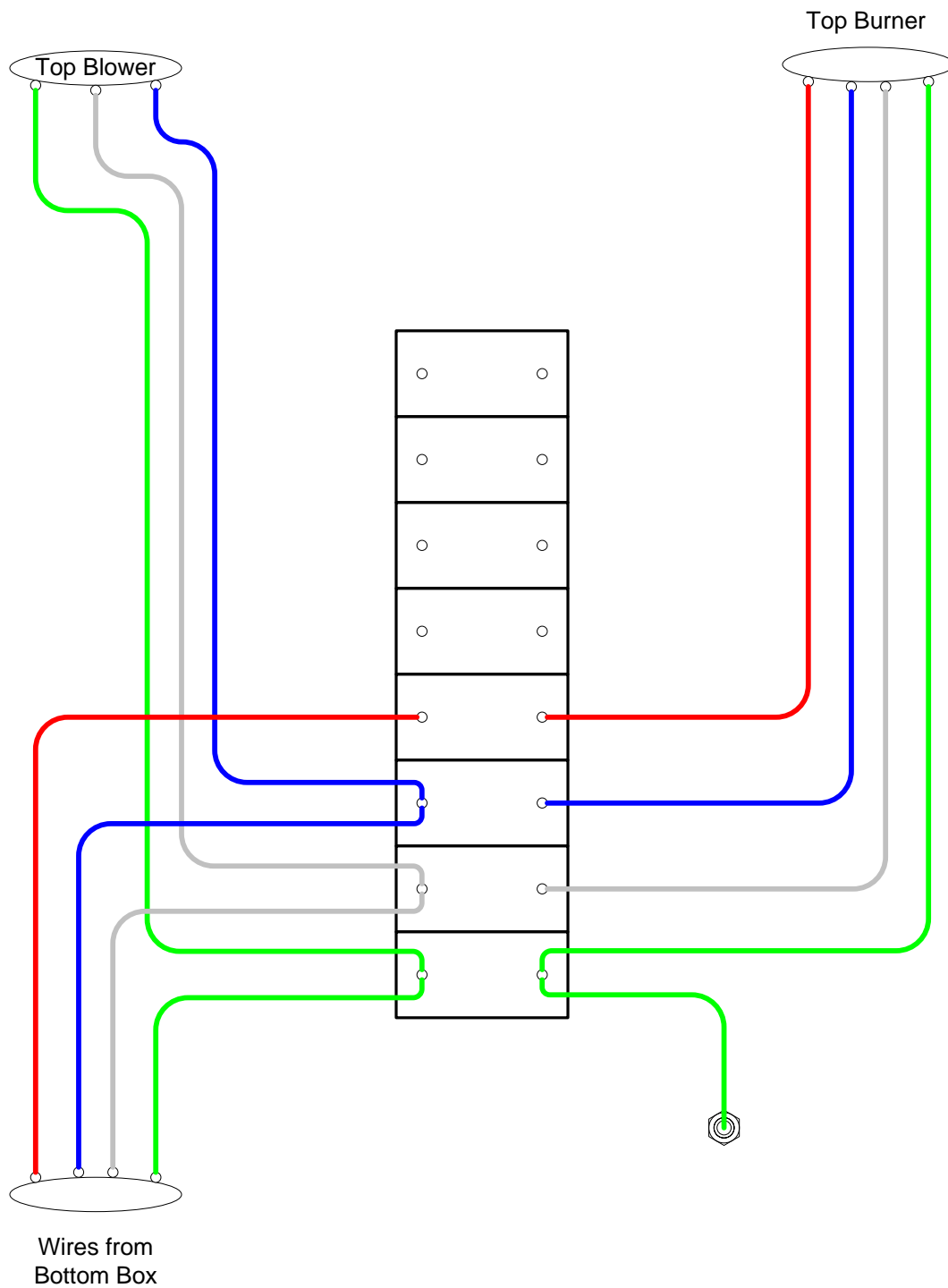
Burner Wiring (Beckett) CY-1020/1050 FA"D"



Wiring (Beckett) CY-2020/2050 FA"D" Bottom Box



Burner Wiring (Beckett) CY-2020/2050 FA"D" Top Box





INCINERATOR MANAGEMENT PLAN

MODULE B: 2BE-HOP1222 (WINDY)

CONFORMITY TABLE

Licence	Part	Item	Topic	Report Section
2BE-HOP1222	D	3	The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.	Main Document and this Module

B1. INTRODUCTION

The Type B Water Licence No. 2BE-HOP1222 issued to TMAC by the Nunavut Water Board (NWB) allows the incineration of approved waste streams.

Old Windy Camp was closed for operations in 2008 and is undergoing closure and reclamation. A New Windy Camp is permitted under the current water licence, but has not yet been constructed. No domestic wastes are produced at Windy Camp and there is no incinerator operated under this Licence. Waste produced in support of the Regional Exploration surface drilling program or generated during water management and licence compliance activities executed under this licence is transported to Doris Camp and managed as part of the Doris Camp waste stream. This waste undergoes the same comprehensive sort-at-source and segregation processes as domestic wastes generated at the Doris Camp. Waste is collected and transferred to the centralized waste management area at Robert Bay for timely incineration.

The Incinerator Management Plan has been prepared and is being submitted by TMAC to address the requirement specified in Part G, Item 5 of the 2AM-DOH1323 Water Licence, and also includes the plan for incineration throughout the Hope Bay belt. The plan addresses all relevant aspects of waste stream management, and the operation, maintenance and monitoring of incinerator units used to burn permitted wastes. The plan includes the management and disposal of all residual ash waste generated by the operation of the incinerator.

B1.1 BACKGROUND

B1.1.1 Overview of Windy Incineration Compliance

Domestic waste is not produced at Windy Camp and is managed as part of the Doris Camp waste stream. Incineration at Doris North, under the prior project owner, was demonstrated to comply with the relevant Canada-wide Standards for incinerator emissions, through effective waste segregation and efficient burn practices. It is the aim of TMAC to continue implementing the practices that reduce the probability of formation of pollutant compounds during waste incineration.

B2. INCINERATOR MANAGEMENT AT WINDY

There is no incinerator operated at Windy Camp at this time.

B3. MONITORING AND EVALUATION

TMAC is required to report a summary of waste disposal activities in the 2BE-HOP1222 Licence Annual Report by March 31 of each year. No wastes are currently deposited under the 2BE-HOP1222 Licence. All incinerator monitoring is reported under the 2AM-DOH1323 Licence Annual Report.

Records of materials deposited to the landfill (when constructed), including qualifying incinerator ash, will be reported annually to the NWB per the relevant requirements of the Licence.



INCINERATOR MANAGEMENT PLAN

MODULE C: 2BB-BOS1217 (BOSTON)

CONFORMITY TABLE

Licence	Part	Item	Topic	Report Section
2BB-BOS1217	D	3	The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.	Main Document and this Module

C1. INTRODUCTION

The Type B Water Licence No. 2BB-BOS1217 issued to TMAC by the Nunavut Water Board (NWB) allows the incineration of approved waste streams.

Boston Camp was closed for operations in 2011 and remains in Care and Maintenance. Waste produced during water management and licence compliance activities is transported to Doris Camp and managed as part of the Doris Camp waste stream. This waste undergoes the same comprehensive sort-at-source and segregation processes as domestic wastes generated at the Doris Camp. Waste is collected and transferred to the centralized waste management area at Robert Bay for timely incineration. No incineration of waste is currently conducted at Boston Camp.

The Incinerator Management Plan has been prepared and is being submitted by TMAC to address the requirement specified in Part G, Item 5 of the 2AM-DOH1323 Water Licence, and also includes the plan for incineration throughout the Hope Bay belt. The plan addresses all relevant aspects of waste stream management, and the operation, maintenance and monitoring of incinerator units used to burn permitted wastes. The plan includes the management and disposal of all residual ash waste generated by the operation of the incinerator.

C1.1 BACKGROUND

C1.1.1 Overview of Boston Incineration Compliance

Domestic waste is not produced at Boston Camp and is managed as part of the Doris Camp waste stream. Incineration at Doris North, under the prior project owner, was demonstrated to comply with the relevant Canada-wide Standards for incinerator emissions, through effective waste segregation and efficient burn practices. It is the aim of TMAC to continue implementing the practices that reduce the probability of formation of pollutant compounds during waste incineration.

C2. INCINERATOR MANAGEMENT AT BOSTON

One incinerator is located at Boston Camp and is a CY-20-20-FA-D model with a capacity of burning 50 kg of waste per hour. This unit is currently inactive and will remain inactive until operational activities resume at the Boston site. Waste generated during seasonal work conducted at Boston Camp is transported to Doris Camp and managed as part of the Doris Camp waste stream.

C3. MONITORING AND EVALUATION

TMAC is required to report a summary of waste disposal activities in the 2BB-BOS1217 Licence Annual Report by March 31 of each year. No wastes are currently deposited under the 2BB-1217 Licence. All incinerator monitoring is reported under the 2AM-DOH1323 Licence Annual Report.



INCINERATOR MANAGEMENT PLAN

**MODULE C - APPENDIX A: OPERATING AND
MAINTENANCE MANUAL**

CY-2020-FA-D

MAINTENANCE
OPERATING SPECIFICATION
&
TECHNICAL DATA
For
CY 2020 FA

CYCLONATOR INCINERATORS

GENERAL COMMENTS

With regulations by the Federal and Local authorities placing strong emphasis on improving our environment and controlling the quality of our air, incineration seems to be the most promising, quick method of waste disposal presently available to us today. The importance of incineration lies in its ability to reduce waste to an absolute minimum ultimate residue as ash, thereby, reducing the cost of labor, handling equipment and hauling of such residue. In addition to lowering of cost, inert residue with a minimum of organic matter can be disposed over unlimited areas.

Generally, incinerators are required to perform satisfactorily over a wide range of operating conditions. They are expected to burn the refuse to ashes without the emission of smoke, bad odors, fumes, ash, charred materials, sparks and the release of toxic pollutants. Air pollution by incinerators has been a major concern to air pollution agencies. The two major causes being: (1) Poor and improperly designed incinerators. (2) Improper operation. The latter has been the primary source of most incinerator complaints.

INCINERATOR DESIGN

Westland (forced air) units are designed to consume type O through type III waste and are built for heavy industrial use. These units meet limited Environmental Standards.

Westland C.A. (controlled air) units are designed to consume type O through type III waste and are developed with more complex control capability in order to meet the more demanding Environmental Standards of the nineteen nineties.

These units are constructed of material that has been tested and proven satisfactory before they are shipped from the factory. They are simple to operate and require very little maintenance. If a reasonable amount of care is taken in the operation of these units, repair costs should be minimal.

TYPES OF WASTE

Type O - Trash - A mixture of highly combustible waste such as paper, cardboard, cartons, wood boxes and combustible floor sweepings from commercial and industrial activities. The mixtures contain up to 10% by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rags and plastic or rubber scraps.

This type of waste contains 10% moisture, 5% incombustible solids and has a heating value of 8500 btu/lb. of refuse as fired.

Type I Rubbish - A mixture of combustible wastes such as paper, cartons, rags wood scraps, floor sweepings from commercial and industrial sources. The mixture contains up to 20% by weight of garbage. This type of waste contains 25% moisture, 10% incombustible solids and has a heating value of 6500 btu/lb. of refuse as fired.

Type II - Refuse - A mixture of rubbish and garbage, mostly residential sources. This mixture has 35 - 80% in composition by weight of rubbish and 65 - 20% of garbage. This type of waste contains 50% moisture, 7% incombustible solids and a heating value of 4300 btu/lb. of refuse as fired.

Type III - Garbage - A mixture of animal and vegetable wastes, restaurants, hotels markets and wastes from institutional, commercial and club sources. This mixture has a composition by weight of 100% garbage and rubbish of up to 35%. This type of waste contains 70% moisture, 5% of incombustible solids and a heating value of 2500 btu/lb. of refuse as fired.

**CY 2000 FA
MODEL 2020 "D" (Diesel Fired)**

PRIMARY BURNER 455,000 Btu/Hr.
SECONDARY BURNER 600,000 Btu/Hr.

1. Fuel Consumption

for type # 2 and # 3 Waste - 29.5 Litres per Hour

Capacity of Fuel Tank for Dual Burner is 682 Litres
Total running Time - 20 Hours of Operation per tank maximum

2. Capacity of Incinerator

#2 Waste - 68 kg.

#3 Waste - 45 kg.

3. Emission Standards:

Each unit has to be individually approved for every type of waste to be incinerated and has to be tested to meet the environmental standards of each province. The model TMF 2020 "D" has been designed to meet the Air Pollution Guidelines of Alberta Environment.

4. Maintenance & Operational Cost:

The interior lining of the incinerator is made to stand rugged use. Although it deteriorates over a period of time, we supply material to reline the inside compartment of the incinerator. As far as the exterior is concerned, the only regular maintenance required is the painting of the exterior steel casing.

Operating Cost: Fuel Consumption - Varies With Usage Per Day.

**CYCLONATOR FORCED AIR INCINERATOR
OPERATING INSTRUCTIONS
DIESEL FIRED – WIC - 201**

Initial Start Up for CY Incinerators

- * Set-up smoke stack and bolt in place
- * Load fuel in tank.
- * Bleed burner
- * Plug in 110 volt power supply to receptacle below the timer
- * Set the Air Timer for 20 Minutes
- * Set the Timer 10 minutes and allow burner to operate for full 10 minutes without any refuse in the combustion chamber. Check if air induction fan is operating, timers functioning and burner operating properly.

Operation

- * Set the timer in off position
- * Open the charging door and load incinerator with refuse up to 60% of full capacity. **DO NOT OVERLOAD.**
- * Close charging door.
- * Set Air Timer for 120 minutes
- * Set Timer for 30 minutes - 1 hour, depending on the amount of refuse left after each burn
- * Clean out ash with a shovel or rake taking care not to damage the refractory. (Note: The ash must be removed after each burn to prevent clogging of the air jets.)
- * Allow the incinerator to cool down for 10 minutes before reloading

Note: Under No Circumstances should the burner be wired direct to the power supply as the air induction system will not function, thus causing the incinerator to overheat.

Failure to comply with the above instructions could result in loss of warranty.

Maintenance

The incinerator requires less maintenance as long as care is taken in its operation. But once in a while, one of its two major components can burn out or overheat. They are the forced air fan and the oil gun burner.

The Forced Air Fan

The blower is manufactured as one complete unit and the only thing that can go wrong with it is the motor. If the motor overheats the whole fan has to be replaced. To replace a blower, first disconnect the power supply. Open the burner-blower casing, detach the electrical connections from the blower to the timer, unbolt the blower base, pull the whole fan out and install a new one.

The Burner

The burner has a few components that a malfunction on either one can result to a non-operational burner. Introduction to these different components is essential. To avoid costly repairs, the following are instructions for removal and replacing burner parts:

1. ELECTRODE ASSEMBLY

Remove screw B, Fig. 3 and rotate transformer on its hinge. After opening the tubing connection at the side of the blower housing, remove clamp nut, E, and disengage the oil line. Remove the firing assembly by rotating it 1/4 turn in a clockwise direction and then pulling it outward and upward. Refer to Figure 11 for firing assembly adjustments. To reinstall

the firing assembly, insert it with the bend of the tubing in the vertical plane and rotate it 1/4 turn counter clockwise so the bend coincides with the outlet in the housing. Make sure the bus bars are positioned so that they will contact the transformer terminal nuts when the transformer is in its normal position.

2. **NOZZLE**

For removal and installation of the nozzle follow the steps for removal of the electrode assembly, change nozzle. Check to see that the electrode gap is 1/8" and that the tips of the electrode are 1/16" in front of the nozzle and 7/16" above the center of the nozzle (See Figure II). Reinstall the electrode assembly. Tighten the clamp nut and also the flare nut.

* Look at blast tube from front end and check nozzle for being in center on end cone opening. If it is not, adjust knurled nut and inside nut on oil pipe.

3. **BLEEDING THE FUEL LINE**

To purge the air from the fuel line and oil pump, loosen the bleeder valve on side of the pump. Close the burner switch and allow the burner to run until there is no air bubbles in the oil issuing from the valve. Then tighten the bleeder valve.

4. **AIR BAND**

If the burner is firing with a lot of smoke, the air band might have moved in transit or altitude has changed. To ensure proper combustion air into the burner, the air band has to be adjusted by loosening the air band locking screw and turning the band to the direction desired for proper combustion. Then retighten the screw.

5. **MOTOR, FAN, FLEXIBLE COUPLING**

Loosen set screw F. Remove the two screws A1 and A2. The motor may now be removed from the housing with the fan and coupling attached to its shaft. To remove the coupling, loosen the set screw and pull rubber coupling away from shaft. To remove the fan from the motor shaft, loosen set screw C. For installation reverse the above procedure.

6. **PUMP**

Loosen screws D1 & D2. Open pipe and tubing connections, loosen set screw F and remove pump.

7. **TRANSFORMER**

Remove Screw B and rotate transformer on its hinge.

For Parts and Service call:

WESTLAND Environmental Services Inc

www.westlandenvironmental.com

Phone No. (780) 447-5052 Fax No. (780) 447-4912

When Ordering Parts Always Give the Following:

1. Model
2. Part Name
3. Part Number
4. Size
5. Quantity

1-BTU = 1.055 x 10⁶ J

TABLE NO. 1
CLASSIFICATION AND DESIGN DATA OF WASTES TO BE INCINERATED

Type of Waste	Description	Principal Components	Approximate Composition % by Weight	Moisture Content % (Design Maximum)	(Average) Incumbustible Solids %	KJ Value Per Kg. of Refuse as Fired (Design Minimum)	Required Minimum Input (kw per Kg Waste)
I*	Rubbish	Combustible waste, paper, cartons, rags, wood scraps, floor sweepings; domestic, commercial industrial sources.	Rubbish 100% (garbage up to 20%)	25%	10%	15000	0
II*	Refuse	Rubbish and garbage; residential sources.	Rubbish 35-80% Garbage 65-20%	50%	7%	10000	1.3
III*	Garbage	Animal & vegetable wastes, restaurants, hotels, markets; institutional, commercial & club sources.	Garbage 100% (rubbish up to 35%)	70%	5%	5815	1.9
IV**	Animal solids & organic wastes.	Carcasses, organs, solid organic wastes; hospital, laboratory abattoir, animal pound, and similar sources.	100% Animal & human tissue	62%	9%	2300	7.5
V	Gaseous liquid or semi-liquid wastes.	Industrial process wastes (tars, paints, solvents, fumes).	Variable	Dependent on predominant components.	Must be determined by wastes survey.		Must be determined by wastes survey.
VI	Semi-solid & solid.	Combustibles requiring hearth, retort, or grate burning equipment (rubbish, plastics, wood wastes).	Variable	Dependent on predominant components.	Must be determined by wastes survey.		Must be determined by wastes survey.

*The above figures are recommended for use in computing heat release, burning rate, velocity and other details of incinerator design.
**Type IV wastes require a "heated hearth" type of incinerator.

INCINERATOR SIZE GUIDE

1. Approximate Usage Guide:

- a) Each man produces approximately 1.4 kg (3 lbs) of Garbage per day when living in a camp.
- b) Each 20 Cu. Ft. Incinerator consumes approximately 45 kg of garbage per hour.
- c) Each 50 Cu. Ft. Incinerator consumes approximately 91 kg of garbage per hour.
- d) Average maximum burn time per incinerator is six (6) hours.
- e) Fuel consumption: (Approximate)

INCINERATOR MODEL	DIESEL LITRE/HOUR	PROPANE LITRE/HOUR	NATURAL GAS CU. METER/HOUR
CY1020FA	16	19	13
CY2020FA	30	35	24
CY1050FA	28	33	22
CY2050FA	41	49	33

2. Fuel Specifications:

- a) Diesel – 1,000 Litres per Cu. Meter (6.25 Gal. Per Cu. Ft.)
- b) Diesel Weights – 1.2 Kg. Per Litre (10 Lbs. per Gal.)
- c) Heating Value (BTU/GAL.) of Diesel Fuel
 - Winter 129,700
 - Summer 132,700
- d) Propane Weights – .6 kg. Per Litre (5 Lbs. per Gal.)
- e) Heating Value of Propane
110,000 BTU/GAL.
- f) Heating Value of Natural Gas
35,000 BTU/CU. Meter

NOTE: Imperial Measure in Brackets

**CYCLONATOR FORCED AIR INCINERATOR
OPERATING INSTRUCTIONS
DIESEL FIRED - HF AFC**

Initial Start Up for CY Incinerators

- * Set-up smoke stack and bolt in place
- * Load fuel in tank.
- * Bleed burner
- * Plug in 110 volt power supply to receptacle below the timer
- * Set the Air Timer for 20 Minutes
- * Set the Timer 10 minutes and allow burner to operate for full 10 minutes without any refuse in the combustion chamber. Check if air induction fan is operating, timers functioning and burner operating properly.

Operation

- * Set the timer in off position
- * Open the charging door and load incinerator with refuse up to 60% of full capacity. **DO NOT OVERLOAD.**
- * Close charging door.
- * Set Air Timer for 120 minutes
- * Set Fuel Timer for 30 minutes - 1 hour, depending on the amount of refuse left after each burn
- * Clean out ash with a shovel or rake taking care not to damage the refractory.

(Note: The ash must be removed after each burn to prevent clogging of the air jets.)

- * Allow the incinerator to cool down for 10 minutes before reloading

Note: Under No Circumstances should the burner be wired direct to the power supply as the air induction system will not function, thus causing the incinerator to overheat.

Failure to comply with the above instructions could result in loss of warranty.

Maintenance

The incinerator requires less maintenance as long as care is taken in its operation. But once in a while, one of its two major components can burn out or overheat. They are the forced air fan and the oil gun burner.

The Forced Air Fan

The blower is manufactured as one complete unit and the only thing that can go wrong with it is the motor. If the motor overheats the whole fan has to be replaced. To replace a blower, first disconnect the power supply.

MODEL **CF500/**
CF800 Oil
Burner

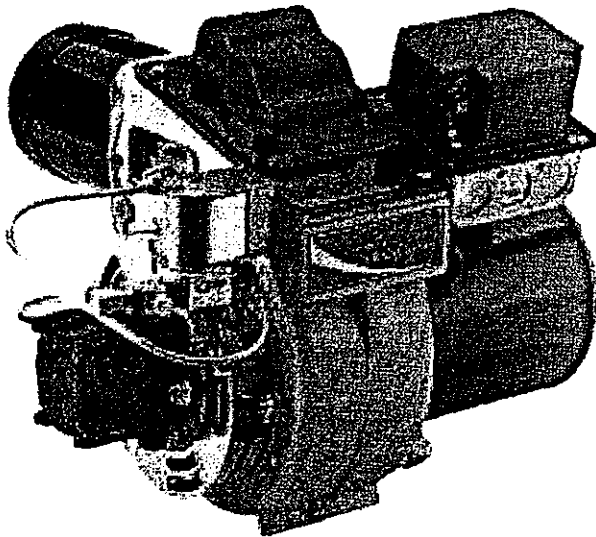
Instruction Manual

ON/OFF Operation

Firing rate: CF500: 1.75 - 5.50 GPH

CF800: 3.00 - 8.00 GPH

Motor voltage: 120 / 60 Hz std.



Thank you for purchasing a
Beckett burner. With proper care and
regular maintenance, it will provide
years of trouble-free service. Please
take a few minutes to read the section
entitled "To the owner" inside this
manual. Then, keep the manual in a
safe place where it can be easily
located if needed by your professional
service technician.

Beckett

Please . . . read this page first

Hazard definitions

The following will be used throughout this manual to bring attention to hazards and their risk factors, or to special information.

DANGER Denotes presence of a hazard which, if ignored, will result in severe personal injury, death or substantial property damage.

CAUTION Denotes presence of a hazard which, if ignored, could result in minor personal injury or property damage.

WARNING Denotes presence of a hazard which, if ignored, could result in severe personal injury, death or substantial property damage.

NOTICE Intended to bring special attention to information, but not related to personal injury or property damage.

To the owner —

WARNING Installation and adjustment of the burner requires technical knowledge and the use of combustion test instruments. Do not tamper with the unit or controls. Call your qualified service technician. Incorrect operation of the burner could result in severe personal injury, death or substantial property damage.

Have your equipment inspected and adjusted at least annually by your qualified service technician to assure continued proper operation.

Never attempt to use gasoline in your heating appliance or to store gasoline or combustible materials near the heating equipment. This could result in an explosion or fire, causing severe personal injury, death or substantial property damage.

To the owner —

WARNING Never burn garbage or refuse in your heating appliance or try to light the burner by tossing burning material into the appliance. This could result in severe personal injury, death or substantial property damage.

Never attempt to use crankcase or waste oil in your heating appliance. This could damage the fuel unit or heating equipment, resulting in risk of severe personal injury, death or substantial property damage.

Never restrict air openings on the burner or to the room in which the appliance is located. This could result in fire hazard or flue gas leakage, causing severe personal injury, death or substantial property damage.

To the installer —

WARNING Read all instructions before proceeding. Follow all instructions completely. Failure to follow these instructions could result in equipment malfunction, causing severe personal injury, death or substantial property damage.

This equipment must be installed, adjusted and started only by a qualified service technician—an individual or agency, licensed and experienced with all codes and ordinances, who is responsible for the installation and adjustment of the equipment. The installation must comply with all local codes and ordinances and with the National Fire Protection Standard for Oil-Burning Equipment, NFPA 31 (or CSA B139-M91).

To the installer —

NOTICE Concealed damage - If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim.

Contacting Beckett for service information or parts - Please record the burner serial number (and have available when calling or writing). You will find the serial number on the Underwriters Laboratories label, located on the left rear of the burner.

NOTICE High altitude installations — Accepted industry practice requires no derate of burner capacity up to 2,000 feet above sea level. For altitudes higher than 2,000 feet, derate burner capacity 4% for each 1000 feet above sea level.

Warranty

Beckett warrants its equipment to those who have purchased it for resale, including your dealer. If you have any problems with your equipment or its installation, you should contact your dealer for assistance.

Refer to warranty sheet in literature packet included with burner for details.

Specifications

Fuels	#1 or #2 Fuel Oil
Firing range	CF500: 1.75 - 5.50 GPH CF800: 3.00 - 8.00 GPH
Motor	1/2 HP 3450 RPM 120/60 hz standard 4.8 amps @ 120 VAC
Ignition Trans.	120V/10,000V
Housing	Cast aluminum
Fuel unit	100 - 200 PSIG
Oil nozzle	45° - 70° solid
Shipping wt.	55 lbs.

Agency approvals

- Underwriters Laboratories has certified this burner to comply with ANSI Standard 296 and has listed it for use with No. 1 or No. 2 fuel oil as specified in ASTM D396. State and local approvals appear on the burner rating label.
- Certified by ULC.
- Approved by Commonwealth of Massachusetts - State Fire Marshall.
- Accepted by N.Y.C. M.E.A.
- Other approvals may be available and must be specified at time of order.

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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.

Pre-installation checklist

☐ Combustion air supply

- 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 B139-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

- 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.

WARNING

The fuel unit is shipped without the by-pass plug installed for CF500/CF800 ON/OFF burners. You must install this plug on two-pipe systems. DO NOT install the by-pass plug in the fuel unit if connected to a one-pipe oil system. Failure to comply could cause fuel unit seal failure, oil leakage and potential fire and injury hazard.

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.
- See **Figure 7** for one-pipe fuel supply installations. See **Figure 8** for two-pipe fuel supply installations.

If fuel supply is **below** the fuel unit —

- Use a two-pipe oil system when the fuel unit must lift the oil more than 8 feet if burner is equipped with a B fuel unit. The return line provided by the two-pipe system is needed to purge the air from the fuel lines and minimize the likelihood of air-related problems during operation.

☐ Vent system

- The flue gas venting system must be in good condition and must comply with all applicable codes.

☐ Electrical supply

- Verify that the power connections available are correct for the burner. All power must be supplied through fused disconnect switches.

☐ Verify burner components —

- Burner box, Model CF500 and CF800
- Air tube assembly (selected per following)
- 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. Find the required firing rate in the 150 psig column (factory-set fuel unit pressure). Select the corresponding nozzle from column 1 (*Rated gph @ 100 psig*).

Table 1 - Nozzle capacities

Rated gph @ 100 psig	Pressure - pounds per square inch	
	140	150
1.75	2.07	2.14
2.00	2.37	2.45
2.25	2.66	2.74
2.50	2.96	3.06
2.75	3.24	3.37
3.00	3.55	3.68
3.50	4.13	4.29
4.00	4.70	4.90
4.50	5.30	5.51
5.00	5.90	6.13
5.50	6.50	6.74
6.00	7.10	7.33
6.50	7.65	7.96

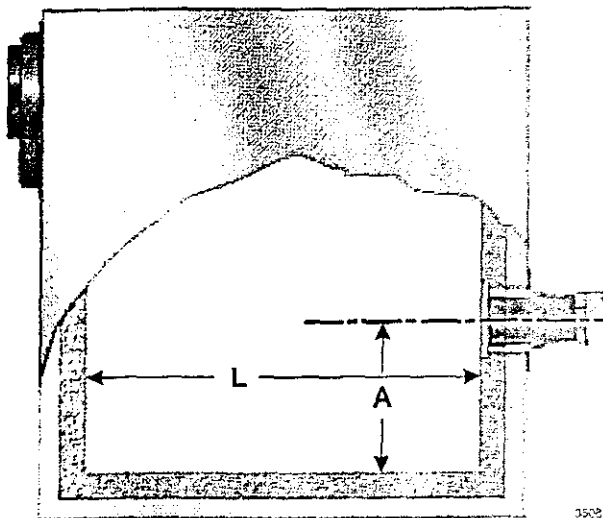
□ Verify firing rate

- 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 1**. If the appliance dimensions are smaller than recommended, reduce the firing rate accordingly.

□ Verify air tube

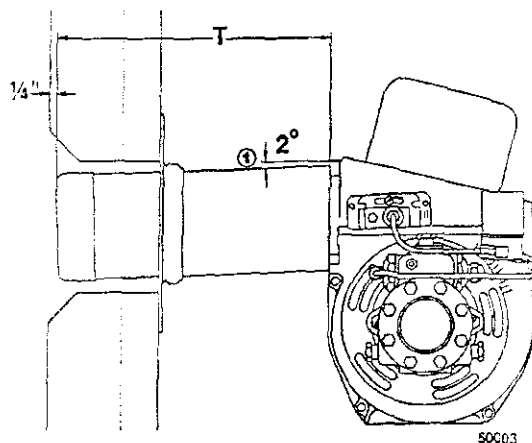
- The information in this section may be disregarded if the air tube is supplied by the appliance manufacturer.
- Tube arrangements available:
 - CF500: 1.75 to 5.50 GPH
 - CF800: A Tube — 3.00 to 7.00 GPH
B Tube — 5.00 to 8.00 GPH
- Maximum firing capacity depends on the firebox pressure. Use **Table 2** to verify the correct air tube for the firing rate required.
- See **Figure 2** to verify the correct air tube length and air tube combination code.

Figure 1 - Min. Combustion chamber dimensions



Firing rate GPH	Minimum dimensions (inches)			
	With damper		Without damper	
	A	L	A	L
1.75 to 3.00	7.5	18.0	8.0	19.0
4.00	8.0	21.0	9.5	23.0
5.00	9.0	23.0	10.5	30.0
6.00	10.0	28.0	11.5	40.0
7.00	11.0	34.0	12.0	46.0
8.00	14.0	38.0	14.0	51.0

Figure 2 - Air tube mounting dimensions



① Install the burner with a 2° pitch as shown.

Air tube length (Dimension T)	A.T.C. Codes (A.T.C. = Air Tube Combination)		
	CF500	CF800	
		Tube A	Tube B
3.00"	CF 60 KK	CF 60 KH	CF 60 KJ
3.00"	CF 80 KK	CF 80 KH	CF 80 KJ
10.00"	CF 100 KK	CF 100 KH	CF 100 KJ
14.00"	CF 140 KK	CF 140 KH	CF 140 KJ
16.00"	CF 160 KK	--	--
17.00"	--	CF 170 KH	CF 170 KJ

Table 2 - Air tube capacity vs. firebox pressure

Firebox pressure (In. w.c.)	CF500	CF800	
	Tube KK (GPH)	Tube KH (GPH)	Tube KJ (GPH)
	No reserve air		
0.0	5.50	7.00	8.00
0.1	4.75	6.25	7.50
0.2	4.00	5.50	6.75
0.3	3.50	4.50	6.25
0.4	2.75	3.75	5.50
0.5	2.00	3.00	5.00

Note: The above ratings may vary 5% due to variations in actual job conditions.

