Boiler Environmental Certification Workbook

For use with MassDEP's Environmental Results Program

Massachusetts Department of Environmental Protection

THE
ENVIRONMENTAL
RESULTS PROGRAM

INTRODUCTION

The Massachusetts Environmental Results Program (ERP) is an on-going environmental performance enhancement and measurement initiative that seeks to cost-effectively improve the environmental performance of whole small business sectors. In this regulatory system, comprised of a unique set of linked regulatory tools, small businesses are educated about their environmental impact and obligations, are required to self-evaluate and certify compliance, and are tracked to measure environmental performance changes. The Massachusetts Department of Environmental Protection (MassDEP) uses a statistical approach to track individual facility and whole-group performance results to identify poor performance areas and to effectively target limited agency compliance assistance and enforcement resources.

The Boiler ERP replaces permits with performance standards that include the use of clean fuels, equipment maintenance, and record keeping requirements for new boilers with a heat input rating between 10,000,000 and 40,000,000 Btu per hour. You must submit an initial certification that you are meeting the environmental performance standards. By simplifying and clarifying the regulatory process, MassDEP hopes to reduce the cost and time required for compliance, while maintaining effective standards and improving environmental results. This workbook provides the information you must understand to meet your environmental obligations.

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GETTING STARTED

[1.1] WHO IS SUBJECT TO ERP FOR BOILERS?

Any ***individual*** boiler with a heat input rating between 10 million and 40 million Btu per hour (approximately 70 to 280 gallons of distillate fuel oil or 10,000 to 40,000 standard cubic feet (scf) of natural gas per hour) installed after September 14, 2001 is subject to the requirements of the Environmental Results Program (ERP) for boilers (Boiler ERP).

For example, if a facility installs:

- One 25 million Btu per hour boiler, the boiler IS subject to Boiler ERP
- One 10 million Btu per hour boiler and one 30 million Btu per hour boiler, both boilers ARE subject to Boiler ERP
- One five million Btu per hour boiler and one 15 million Btu per hour boiler, only the 15 million Btu per hour boiler is subject to Boiler ERP
- Three five million Btu per hour boilers, the facility is not subject to Boiler ERP

Please Note: Boilers larger than 40 million Btu per hour are subject to the requirement to obtain a plan approval from MassDEP. See:
http://www.mass.gov/dep/air/approvals/aqforms.htm#airpapp

Also Note: if you replace only the burner in a boiler you are not subject to Boiler ERP.

[1.2] WHO SHOULD READ THIS WORKBOOK?

Boiler Installer:

All boilers with a heat input rating between 10 million and 40 million Btu per hour installed after September 14, 2001 must meet the air emission limits specified in the boiler ERP regulation [310 CMR 7.26(33)] and outlined in this workbook. Therefore, it is crucial that you understand the requirements to ensure that the boiler you install is capable of meeting the standards. You are also a primary source of technical expertise to your customers. Providing the information and service that your customer needs to operate and maintain the boiler as efficiently and cleanly as possible not only minimizes emissions but is a good business practice as well.

Facility Owner/Administrator:

As the owner or chief administrator of the facility, it is important that you understand the regulatory requirements described in this workbook. It is your responsibility to ensure that your new boiler is operated in compliance with the applicable environmental

regulations. By ensuring that the "hands-on" person who operates the boiler understands the material in this workbook, you can make sure that the new boiler is run cleanly and efficiently, with minimal impact to the environment. You will also be confident that the compliance certification you sign is completed accurately and truthfully.

In addition to focusing on reducing combustion emissions, the workbook also describes your options for managing boiler-related wastewater (boiler blowdown). Under the heading "Related Activities" this workbook provides information you may need if you remove an old boiler, or if underground petroleum storage tanks are located on your property.

Boiler Operator:

As the boiler operator, it is equally important that you understand the material in this workbook. You are the "hands-on" person who has the daily responsibility to operate and maintain the boiler properly. To ensure compliance you must understand the fuel, stack, operational and record keeping requirements. You should also read the Related Activities section beginning on page 13 if you must dispose of an old boiler or if you manage underground petroleum storage tanks.

[1.3] KEY THINGS YOU SHOULD KNOW AS A FACILITY OWNER / ADMINISTRATOR

- **You must install a boiler that is capable of meeting the emissions standards specified in Section 2-2 of this workbook**.
- **You must use specified clean fuels:** The cornerstone of the Boiler ERP is the use of the following fuels:

  On or before July 1, 2009 - natural gas and/or distillate fuel oil (no more than 0.05% sulfur by weight).

  After July 1, 2009 – natural gas or ultra low sulfur (no more than .0015% sulfur by weight) distillate (ULSD) fuel oil.

  Natural gas-fired boilers emit significantly lower levels of particulate matter (PM), nitrogen oxides (NOx), and sulfur oxides (SOx) than boilers fired with other fuels. An example of the differences in potential emissions is shown in Tables 1a and b on page 7 in this workbook. Although the use of distillate or ULSD fuel oil results in slightly higher emissions than natural gas, they are significantly cleaner than other grades of oil or solid fuels. For example, the sulfur contents allowed in #2 distillate ("home heating oil") and #6 residual fuel are 0.3% and up to 2.2% sulfur by weight, respectively.
- **Using these fuels and boilers protects public health:** The air pollutants emitted by boilers have significant health impacts, especially to the very young, the elderly, and the people suffering from respiratory illnesses. Particulate matter, especially the small-sized particulate matter generated by fuel combustion, can

cause and contribute to serious respiratory problems. SO_2 and NOx are respiratory irritants and key ingredients in the formation of acid rain. NOx is also a major contributor to summertime smog.

- **You must submit the certification *prior* to the installation of the boiler.** This is a one-time certification. Certification Forms are available through MassDEP's web site at http://www.state.ma.us/dep/erp.
- ***N.B.* MassDEP eliminated the requirement to file an annual certification.**
- If you are otherwise required to submit a source emissions report under 310 CMR 7.12, you must include the boiler(s) installed under the ERP regulation in your next required submittal.
- If you are uncertain how to file a Source Registration, you should go to the Source Registration website at: http://www.mass.gov/eea/agencies/massdep/service/online/source-registration.html.
- **There is no fee associated with the certification.** Please note that your facility still may be subject to other MassDEP fees, such as the annual air quality or hazardous waste compliance assurance fees.
- **The Boiler ERP regulation has three exemptions:**
  1. *New wood fuel boilers:* you must submit a plan application under the permitting regulations, and receive written approval from MassDEP before the boiler can be installed and operated.
  2. **F***acilities subject to the Air Operating Permit program under 310 CMR 7.00 Appendix C* are exempt from Boiler ERP. If your facility has one or more boilers certified under ERP when it becomes subject to Appendix C, you must continue to comply with the ERP boiler performance standards and document compliance in the semi and annual operating permit certifications.
  3. *Temporary boilers* installed in accordance with 310 CMR 7.03(23) are exempt from Boiler ERP.
- **Installation of a new boiler can increase facility-wide potential emissions above regulatory thresholds.**

  Potential emissions of the new boiler may cause total emissions from your facility to exceed an emission cap contained in one of the following approvals that your facility obtained previously from MassDEP:

  - Limited or Comprehensive Plan Application
  - 50% / 25% Facility Emission Cap
  - Restricted Emission Status

Potential emissions of the new boiler may also cause the total potential emissions from your facility to exceed thresholds for other air pollution control requirements, including:

- New Source Review (NSR)
- Operating Permits
- Prevention of Significant Deterioration (PSD).

Tables 1a and 1b display the potential emissions of criteria pollutants generated by several fuel burning scenarios in order to help you determine if your new boiler could cause your facility to exceed an emissions cap or threshold. Emissions are calculated for the smallest and largest size boilers that are subject to ERP. Potential emissions resulting from burning #6 residual fuel (1% sulfur) are included to demonstrate the differences between burning "clean" fuels under ERP and 1% sulfur fuel, #6 residual fuel.

Table 1a

Potential[1] Emissions in Tons Per Year (10 MMBTU / Hour Capacity Boiler)

Fuel	NOx	SOx	VOC	PM	CO
Natural Gas 12 Months	1.5	0.03	1.3	0.44	3.5
ULSD 12 Months	6.6	0.03	1.3	0.88	3.5
Natural Gas-9 Months ULSD-3 Mo.	2.8	0.03	1.3	0.55	3.5
#6 Residual Fuel 12 Months	13.1	47.4	*0.34	*2.14	*1.5
Major Source Threshold	50	100	50	100	100

[1] Potential emissions mean the maximum capacity of a boiler to emit a pollutant while operating continuously, i.e., 8,760 hours per year.

* These potential emissions are calculated using EPA AP-42 emission factors. The other potential emissions are calculated using regulatory emission limits established in boiler ERP.

Table 1b

Potential[1] Emissions in Tons Per Year (40 MMBTU / Hour Capacity Boiler)

Fuel	NOx	SOx	VOC	PM	CO
Natural Gas - 12 Months	6.1	0.11	5.3	1.75	14
ULSD - 12 Months	26.3	0.13	5.3	3.5	14

Natural Gas-9 Months ULSD-3 Mo.	11.1	0.11	5.3	2.18	14
#6 Residual Fuel - 12 Months	52.6	190	*1.36	*8.56	*6.0
Major Source Threshold	50	100	50	100	100

If you have any questions concerning whether or not your facility is subject to any of these programs, please call your MassDEP Regional Service Center for additional information and guidance. See the following link: http://www.mass.gov/eea/agencies/massdep/service/.

Compliance with the requirements of Boiler ERP does not relieve you of the responsibility of complying with other regulations, i.e., federal 40 CFR 63 Subpart DDDDD – Boiler MACT and federal 40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial Steam Generating Units, which requires notification, record keeping, and reporting to the U.S. EPA. The EPA Customer Service Center may be called at (617) 918-1111.

The following sections describe the specific air quality and industrial wastewater requirements.

AIR QUALITY REQUIREMENTS

[2.1] FUEL REQUIREMENTS

Boiler ERP limits the types of fuel that can be used to certain clean fuels. Note that the as of July 1, 2009 the types of allowed fuels change.

- **Before July 1, 2009**
  - **Natural Gas** must be the *primary* fuel for boilers subject to ERP, if a natural gas pipeline, having sufficient capacity, exists beneath a street or sidewalk adjacent to the property.
  - If a natural gas pipeline having sufficient capacity does not exist adjacent to the property **distillate fuel oil** may be burned as the *primary* fuel.
  - Boilers required to burn natural gas as the primary fuel ***may*** burn distillate fuel oil for up to a maximum of 180 days per calendar year. Annual distillate fuel use (gallons/year) allowed is calculated by multiplying 90 days/yr x 24 hours/day x maximum firing rate (gals/hour) per boiler. Records must be established and maintained up to date in accordance with 310 CMR 7.26(36) Recordkeeping and Reporting as explained in Section 2.4.

- **On and After July 1, 2009**

  Only natural gas and ULSD, as defined in 310 CMR 7.26(31), are allowed (delivery of distillate fuel oil *accepted* after July 1, 2009 must be ULSD. However, you may use your remaining supply of distillate fuel oil, if its sulfur content is less than 0.05% sulfur by weight).

  Boilers equipped with dual fuel capability may burn natural gas or ULSD in any combination. These fuels are defined in this workbook on pages 14 and 15.

Fuel additives may only be used according to the manufacturer's instructions.

[2.2] EMISSION LIMITS

Each owner or operator must:

- **Install** a boiler that is able to comply with emission limits specified in Table 2.
- **Keep documentation** that the boiler as *designed* and *installed* will comply with the emission limits specified in Table 2.

  (The documentation may be in the form of a written statement from the manufacturer or actual emission test results. The emission limits are in pounds of pollutant per million Btu of fuel input. The boiler industry often specifies emissions in units of "parts per million" (ppm). Therefore, the nitrogen oxides (NOx) and carbon monoxide (CO) emission limits are also listed, in brackets, in equivalent units of ppm in Table 2.)
- **Operate** the boiler in accordance with the manufacturer's instructions.

Table 2

	Natural Gas		**Distillate**	
	(lbs. per mmBtu)	[ppm]	(lbs. per mmBtu)	[ppm]
NOx	0.035	[30]	0.15	[116]
Particulate mattter	0.01		0.02	
Carbon Monoxide*	0.08	[100]	0.08	[100]
VOC's	0.03		0.03	

* The carbon monoxide emission limits for natural gas and ULSD fuel do not apply to high turndown boilers **while** they are operating at less than 25 % of their maximum input rating.

Sulfur dioxide emissions are established by limiting the sulfur content of the fuel. The sulfur content of the fuel, as certified by the fuel supplier, is limited to:

1. Natural Gas	N/A
2. ULSD Fuel Oil	0.0015% by weight

Visible emissions may not exceed 10% opacity at any time during boiler operation. Visible emissions do not include water vapor.

[2.3] PERFORMANCE STANDARDS

- Boilers must be operated and maintained according to the manufacturer's instructions, in order to ensure efficient combustion and compliance with the emissions standards.

- One tune-up per year is required because tune-ups are considered crucial to efficient, clean operation.

- Tune-ups must incorporate an efficiency test. Efficiency tests must include at least a smoke spot reading, measurement of carbon monoxide, carbon dioxide, oxygen concentrations, and flue gas temperature.

- Boilers equipped and operated with an *automated combustion control system* (see Definitions section) must be maintained and serviced as specified by the manufacturer.

[2.4] RECORDKEEPING REQUIREMENTS

- The following records must be kept onsite for at least three years. This means that each individual record must be retained onsite for three years from the date it was "generated".
    - A record of the type and the amount of fuel used each month, in gallons or cubic feet, as appropriate.
    - Fuel sulfur content (percent), as certified by your fuel supplier for each shipment or in other supporting documentation.
    - Results of tune-up(s) including efficiency test results.
    - All purchase orders and invoices related to the boiler operation and maintenance.

- The following items must be kept *onsite* for the life of the ERP boiler(s).

    - Manufacturer's operating instructions.
    - Documentation from the manufacturer that the boiler as designed and installed meets the required emission limits when operated according to the manufacturer's instructions.
    - If applicable, the results of an air quality model run which demonstrates that boiler emissions have not caused an exceedence of the National Ambient Air Quality Standards (NAAQS).

[2.5] STACK DESIGN REQUIREMENTS

Proper stack design addresses *location, height,* and *exit velocity*.

There are three basic requirements for stack design:

[2.5.a] To minimize plume entrapment in wakes caused by obstructions to air streams, the height of your stack must be at least **1.5 times the height of your building** from ground level.

If this condition cannot be met, OR if any adjacent structures **(**see adjacent structure in Definitions) are taller than your stack then Air Quality Modeling MUST be performed to document that the NAAQS will not be exceeded. *Appendix 1* lists the minimum data inputs that would be needed to execute an EPA Screen3 Model run. Modeling information is available at the following EPA website: http://www.epa.gov/scram001/dispersion_screening.htm. If you need assistance, call the BWP Air Planning & Evaluation Branch at 617-292-5607.

[2.5.b] The stack must discharge exhaust gas vertically upwards.

[2.5.c] Stack heads, devices used to prevent precipitation from entering the stack, must not restrict the vertical flow of the exhaust gas stream. Devices such as "shanty caps" and "egg beaters" are prohibited. Coning of the top of the stack and rain sleeves are acceptable. No more than a one-inch change in diameter to every five inches in length of cone is recommended in order to avoid serious backpressure that may affect air flow at the point of origin.

Although not specifically required, MassDEP also recommends the following:

- There should be no fresh air intakes near the stack.
- The flue gas exit velocity should be at least 40 feet per second.
- The construction material can affect the acid dew point and ultimately the life of the stack. Therefore, it is wise to invest in a new stack at the time the boiler is being replaced, if the existing stack does not meet the general standards listed above.

INDUSTRIAL WASTEWATER REQUIREMENTS

"Boiler blowdown" is the wastewater stream associated with boilers. It is water released periodically from a boiler to remove impurities and sediment. It is regulated as industrial wastewater. The purpose of releasing blowdown is to limit the buildup of contaminants in the boiler water that may degrade boiler performance and increase maintenance costs. Contaminants may include one or more of the following: dissolved/suspended minerals, heavy metals (iron, copper), corrosion inhibitors, oil, or algicides.

Boiler blowdown can degrade groundwater or surface water quality, and therefore, must be properly managed. Your options for managing blowdown are briefly described below.

[3.1] Boiler blowdown can be discharged to a sewer. Contact your local sewer authority to determine if there are any special requirements for boiler blowdown. Contact information: Massachusetts Water Pollution Control Association (www.mwpca.org or call 781-939-0918).

[3.2] Boiler blowdown MAY NOT be discharged to a septic system. If discharge to a sewer is not possible, you must obtain a groundwater or surface water discharge permit, or store your boiler blowdown in a holding tank or container (see section 3.5 below).

[3.3] Discharge to a surface water body (e.g., storm drain, river, lake, or stream) requires a National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency (EPA). For more information, call the EPA at (617) 918-1111 (Customer Service Center).

[3.4] Discharge to groundwater or directly on the ground requires a groundwater discharge permit issued by MassDEP. The permit, BRP WP 10 - Other Groundwater Discharges, is reviewed and approved by MassDEP's Bureau of Resource Protection, Water Pollution Control Program. There is an application fee, and more detailed information can be obtained on the MassDEP website. The permit application package is available through the MassDEP website at: http://www.mass.gov/dep/water/approvals/surffms.htm#groundwater .

[3.5] Storage of boiler blowdown or other non-hazardous industrial wastewater in a holding tank requires compliance with design and operating standards and submission of a one-time compliance certification to MassDEP. Holding tank certification packages are available at: http://www.mass.gov/dep/service/online/erpforms.htm#holdingt

If you store boiler blowdown in a container you must comply with design and operating standards, but you need not submit a compliance certification form for the holding tank. Call the appropriate MassDEP regional office for information (http://www.mass.gov/eea/agencies/massdep/service/).

You may use an evaporator to reduce the volume of boiler blowdown before shipping it offsite. A permit is not required. Test evaporator sludge to determine if it is a hazardous waste and needs to be handled as such. If you have samples of evaporator sludge tested, the results should be kept on file.

IF boiler blowdown contains a layer of oil (more than a sheen), it must be stored and disposed of as a waste oil.

RELATED ACTIVITIES

[4.1] Asbestos removal and related construction and/or demolition:

Asbestos is a known carcinogen and has been linked to a variety of respiratory ailments such as asbestosis, mesothelioma and lung cancer. Tiny microscopic asbestos fibers from loose or crumbling asbestos can be suspended in air, inhaled and remain in the lungs causing severe health effects during removal or demolition operations.

- Any removal, disturbance, encapsulation or enclosure of these asbestos materials requires notification to the MassDEP (Asbestos Notification Form - ANF 001) **at least ten working days in advance.**

- Any related construction and/or demolition activity requires notification to the MassDEP (Notification Prior to Construction or Demolition - BWP-AQ 06) **at least ten days in advance.** These notification forms and information on the associated fee are available through the MassDEP Web site at: http://www.mass.gov/eea/agencies/massdep/air/programs/asbestos.html

- All materials containing asbestos, such as may be found around ducts and old boilers, must be wetted, containerized, labeled and removed by a state-certified contractor in accordance with MassDEP regulations.

[4.2] Underground petroleum storage tanks:

Single wall, bare steel underground storage tanks containing petroleum products, including those resting on the ground, were required to meet leak detection and corrosion protection standards, or be replaced, as of December 22, 1998. For more information, contact your local fire department.

DEFINITIONS AND TERMS

Acid dew point: temperature at which the flue gas condenses on the stack surface.

Adjacent structure: means a structure that is within 5L of the stack. 5L means five times the lesser dimension (height or maximum horizontal width) of the structure.

Air contaminant: volatile organic compounds (VOC's), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and particulate matter are contaminants of concern in achieving air quality standards in the United States. Each geographic area is required to meet specific limits for each contaminant.

Automated Combustion Control System: a system that self adjusts burner/boiler operation to maximize energy efficiency. It must include at least the following capabilities: fuel/air ratio adjusted automatically, fuel flow metered/monitored, and continuous monitoring of nitrogen oxides and carbon monoxide.

Boiler: a device that combusts any fuel and produces steam or heats water.

Boiler blowdown: water released from a boiler to remove impurities and sediment.

Container: means any portable device used to accumulate, store, treat and transport industrial wastewater, which is movable without any motorized mechanical device (including but not limited to forklifts). Containers requiring motorized mechanical devices for movement are classified as holding tanks.

Distillate Fuel Oil: for the purposes of 310 CMR 7.26(30) means fuel oil that complies with the specifications for fuel oil numbers 1 or 2 as defined by the American Society for Testing and Materials in ASTM D396-98, "Standard Specification for Fuel Oil" dated September 1998 and has a sulfur content not to exceed 0.05% by weight or D6751 for bio-diesel and has a sulfur content not to exceed 0.0015% by weight.

Emission: any discharge or release of an air contaminant to the ambient air

Holding Tank: means a stationary device, constructed of non-earthen materials (e.g. concrete, steel or plastic), that provide structural support, used to accumulate and store industrial wastewater. Containers requiring motorized mechanical devices for movement are classified as holding tanks. Tanks that are transportable but not mounted on a truck, or placed on or mounted on a trailer are considered holding tanks. The term holding tank does not include mobile tanks as described under these regulations.

National Ambient Air Quality Standards: Massachusetts is subject to national standards that deal with six criteria pollutants: particulate matter (PM), nitrogen oxides (NOx), sulfur dioxide (SOx), ozone, carbon monoxide (CO) and lead.

Natural Gas: a naturally occurring mixture of hydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal constituent is methane, or liquid petroleum gas (LPG), as defined by the American Society for Testing and Materials. LPG includes propane, butane, or a combination of propane and butane.

Source Registration/Emission Statement: Any person who operates a new boiler subject to this ERP program is required to submit a Source Registration and Emission Statement, including BWP AQ AP-1 form to MassDEP.

Ultra Low Sulfur Distillate (ULSD): any fuel oil or other fuel, excluding used oil fuel and hazardous waste fuel, which complies with the applicable U.S. Environmental Protection Agency sulfur limits for fuel pursuant to 40 CFR 80.29, 40 CFR 80.500, and

40 CFR 80.520(a) and (b) as in effect on January 18, 2001 and either complies with the specifications for fuel oil numbers 1 or 2 as defined by the American Society for Testing and Materials (ASTM) in ASTM D-396-98 or D6751 for bio-diesel.

Appendix 1

Minimum Data Inputs Required for an EPA Screen3 Model Run

1. Stack height (feet) =>
2. Stack inside diameter (feet) =>
3. Stack gas exit temperature (^{o}F) =>
4. Stack flow rate (cubic feet per minute) =>
5. Building height (feet) =>
6. Minimum horizontal building width (feet) =>
7. Maximum horizontal building width (feet) =>
8. Type of fuel (natural gas or red dye distillate fuel oil) =>
9. Millions of Btu per hour of fuel input =>
10. Emission rate (grams per second) =>