

AIR MANAGEMENT PROGRAM FACT SHEET



Combustion Sources and Air Pollution Construction Permits

December 2021

This fact sheet offers specific guidance to combustion sources that may require a construction permit.

What is a combustion source?

A combustion source is a unit that burns fuels that are in gaseous (natural gas), liquid (fuel oil) or solid (coal or wood) form. An industrial or commercial size combustion source is usually used to create heat or steam but some may actually generate electricity. Some examples of combustion sources: boilers, furnaces, space heaters, emergency or back-up generators, or incinerators.

Combustion sources will emit criteria pollutants: particulate matter (PM), particulate matter with aerodynamic diameter of 10 micrometers or less (PM_{10}), fine particles with aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), and volatile organic compounds (VOCs). Depending on the type of fuel burned, different hazardous air pollutants also may be emitted.

Combustion sources and construction permits

All facilities considering installing a boiler or furnace to heat a building or make process steam as well as those with plans to update an existing boiler or furnace may be required to file an application for an air pollution construction permit with the Wisconsin Department of Natural Resources (DNR).

Exemptions from construction permits

Some small boilers and furnaces may be exempt from the requirement to apply for a construction permit. If the unit the facility wants to install or modify (or if multiple units, each one) has a maximum heat input capacity less than one of these, it is exempt:

- 1 million British Thermal Units (mmBTU) per hour of coal, coke or solid fuel
- 5 mmBTU per hour of wood, wood combined with liquid or gaseous fuel, residual or crude fuel oil
- 10 mmBTU per hour of #2 or diesel fuel oil
- 25 mmBTU per hour of natural gas or propane

How to apply for a construction permit

If the facility is not exempt from the construction permit requirements, review the permit options. There are currently three types of permits available to sources undergoing construction or expansion:

- Registration Operation Permits - These permits cover facilities that can limit emissions to 25 percent, 50 percent, or if enrolled in Tier 2 of the Green Tier program, 80 percent of the major

source thresholds. ROPs allow construction without a permit as long as the eligibility thresholds continue to be met.

- General Operation Permits - which are only available for certain industries but also allow construction without a permit if the facility meets the permit criteria.
- Source-specific construction permits - which are written specific to a facility's operations.

What is the application cost?

For registration and general permits there are no application fees. However, there is an annual fee based on which permit the facility is issued:

- Registration Operation Permits: \$400
- General Construction Permits:
 - \$400 if emissions capped less than 80 tons per year (TPY)
 - \$4100 if at least 80 TPY but less than 100 TPY

When applying for a source-specific construction permit, enclose a check for \$7,500, payable to the Department of Natural Resources, when the application is submitted. Costs associated with the construction permit review process will vary depending on which requirements apply to the proposed project. Some costs are outlined below.

- \$3,000 minor source review
- \$12,000 major source review
- \$4,500 for minor modifications
- \$12,000 for major modifications
- \$2,500 for a stack test of a single pollutant, and \$1,250 for each additional pollutant up to three; maximum of \$6,000 (may not be required in all permits)
- Additional fees may apply depending on the type of project

The application fee will be returned by DNR if the project does not need a construction permit or it will be applied to the facility's final fee if the project does need a permit. If a permit is not required, construction can begin. If a permit is required, wait until a permit is issued by DNR to begin construction.

What are the permit review steps?

Registration and general permits have simple check-list style application forms. [Application forms](#) are available on DNR's website on the General and Registration Permit Forms tab.

Applying for a source-specific construction permit is a more extensive process. After a complete application is submitted, DNR staff review, which can take from 20 to 60 days or more depending on the size of the project and the current queue of applications. When the review is completed, DNR prepares a preliminary decision to approve or deny the application and publishes a notice in the Wisconsin State Journal and online on the [Air Permit Public Notices](#) webpage. The notice gives the public 30 days from the date the notice was posted online to comment on the proposed project. This is also the facility's chance to review the permit and provide DNR with comments on the permit.

If the public shows significant interest in the proposed project or specifically requests a public hearing DNR will schedule a hearing within 60 days after the end of the public comment period. Then DNR will issue or deny the construction permit within 60 days after the close of the public hearing. Note a public hearing could add up to 120 days to the process.

If there is minimal interest during public comment, DNR can issue the permit immediately after the 30 days. Once issued, the construction permit is effective for 18 months, with a possibility for a one time 18-month extension upon request.

Calculating emissions for the permit application

Boiler rating

First, determine the rating of the combustion unit (assume it is a boiler). The rating is also known as the heat input to the boiler. It is often expressed in terms of units of energy input to the boiler for each hour of operation, such as British Thermal Units (BTU), boiler horsepower (BHP) or pounds of steam per hour. Find the rating information on the boilerplate on the boiler or contact the boiler's manufacturer. There may be different ratings for different fuels.

Whichever units the rating is listed in will need to be converted to million BTU (mmBTU) for the calculations. Conversions can be calculated by:

- a) 1 boiler horsepower (BHP) = 0.05 mmBTU/hr
- b) 1 pound of steam/hr = 0.0017 mmBTU/hr

For example:

$$200 \text{ BHP} \times 0.05 \text{ MMBTU/hr} / 1 \text{ BHP} = \mathbf{10 \text{ MMBTU/hr}}$$

OR

$$5800 \text{ lb steam/hr} \times 0.0017 \text{ MMBTU} / 1 \text{ lb steam} = \mathbf{9.9 \text{ MMBTU/hr}}$$

Fuel heating value

Next, find the heating value or heat content of the fuels used, including any back up fuels. This value is usually measured in units of energy per volume. For natural gas the volume is measured in standard cubic feet (SCF). Usually, the volume used is large enough that it is measured in million SCF or 10^6 SCF (SCF6). Fuel oil would be measured in thousand gallons or 10^3 gallons (GAL3).

If the facility uses fuel oil, find the sulfur content in the fuel in units of percent by weight.

For example:

A value of 0.5 percent sulfur by weight would be determined from a calculation:

$$0.005 \text{ lbs sulfur} / 1 \text{ lb fuel} \times 100 = \mathbf{0.5 \%}$$

The heating value and sulfur content of the fuel is available from the fuel supplier and can be requested in the appropriate units.

Fuel throughput

The third item needed is the maximum throughput of the facility's fuels. To figure out the throughput use the boiler rating and the heating value. For example, use a 9.0 mmBTU/hr rating for the boiler, a heating value of 1050 mmBTU/SCF6 for natural gas and 140 mmBTU/GAL3 for the backup #2 fuel oil. The throughput is calculated by dividing boiler rating by heating value.

$$\text{Natural gas} = 9 \text{ mmBTU/hr} / 1050 \text{ mmBTU/SCF6} = \mathbf{0.0086 \text{ SCF6/hr}}$$

$$\text{\#2 fuel oil} = 9 \text{ mmBTU/hr} / 140 \text{ mmBTU/GAL3} = \mathbf{0.064 \text{ GAL3/hr}}$$

Maximum Theoretical Emissions

Finally, calculate the Maximum Theoretical Emissions (MTE). MTE is defined as the amount of air pollution emitted into the air if the facility operated its equipment at its maximum production capacity for 24 hours a day, 365 days a year without any control device. When multiple materials are used at a process, take the worst case of all materials to determine the MTE.

To calculate the MTE find the emission factors for each of the types of fuels burned at the facility. Emission factors can be found:

- 1) in an EPA document called [AP-42](#);
- 2) through the trade association; or
- 3) from the fuel supplier.

MTE rates are calculated by multiplying throughput by the emission factor.

The S in the SO₂ emission factor for #2 fuel oil is the percent sulfur by weight. If it is assumed that the facility uses a low sulfur fuel, where S is 0.05% by weight, the final emission factor is:

$$142 \times 0.05 = 7.1 \text{ lb S/GAL3}$$

Emission Factors from AP 42		
Pollutant	Natural Gas (lb/SCF6)	#2 Fuel Oil (lb/GAL3)
PM	12	2
NO _x	100	20
SO ₂	0.6	142S
CO	21	5
VOC	5.3	0.34

Natural gas

$$\text{SO}_2 = 0.6 \text{ lb/SCF6} \times 0.0086 \text{ SCF6/hr} = \mathbf{0.005 \text{ lb/hr}}$$

#2 fuel oil

$$\text{SO}_2 = 7.1 \text{ lb/GAL3} \times 0.64 \text{ GAL3/hr} = \mathbf{0.45 \text{ lb/hr}}$$

The worst case SO₂ MTE rate is for the #2 fuel oil at 0.45 lb/hr. Comparing this with the MTE general exemption levels, this is less than the 9.0 lb/hr level for SO₂.

Continue to do this calculation for each pollutant, determining which fuel has the higher MTE of each pollutant and including that higher rate for the pollutant in the application. The Small Business Environmental Assistance Program (SBEAP) has a [Microsoft Excel spreadsheet](#) for use to calculate emissions.

For more information:

Permit application materials and instructions are available on [DNR's website](#).

For questions about how to complete the forms contact DNR or the SBEAP to help arrange a pre-application meeting.

- SBEAP, 855-889-3021, DNRSMBusiness@wisconsin.gov or visit their [webpage](#).
- DNR's Air Management Program [permit staff](#).

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