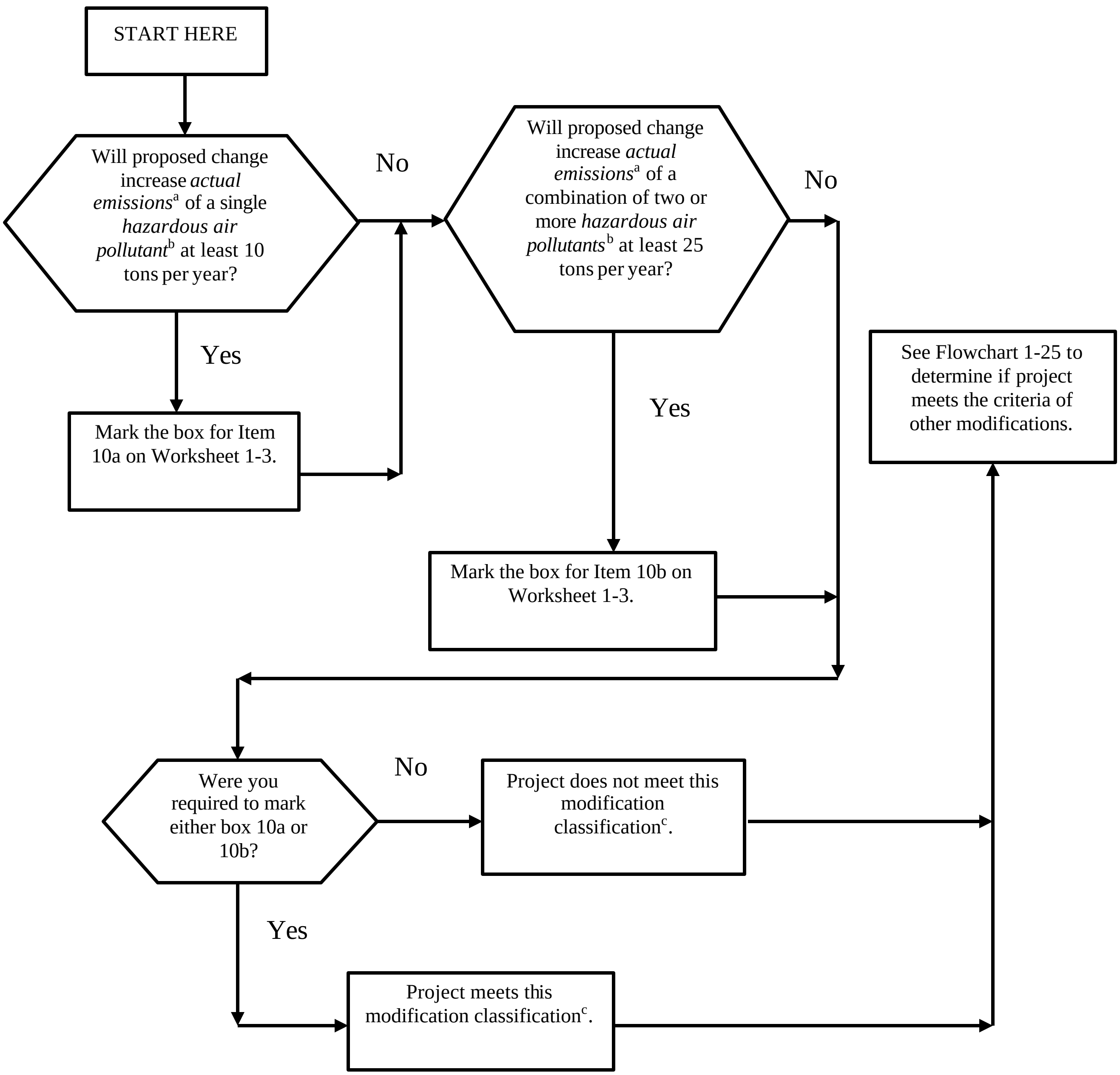
Flowchart 1-24

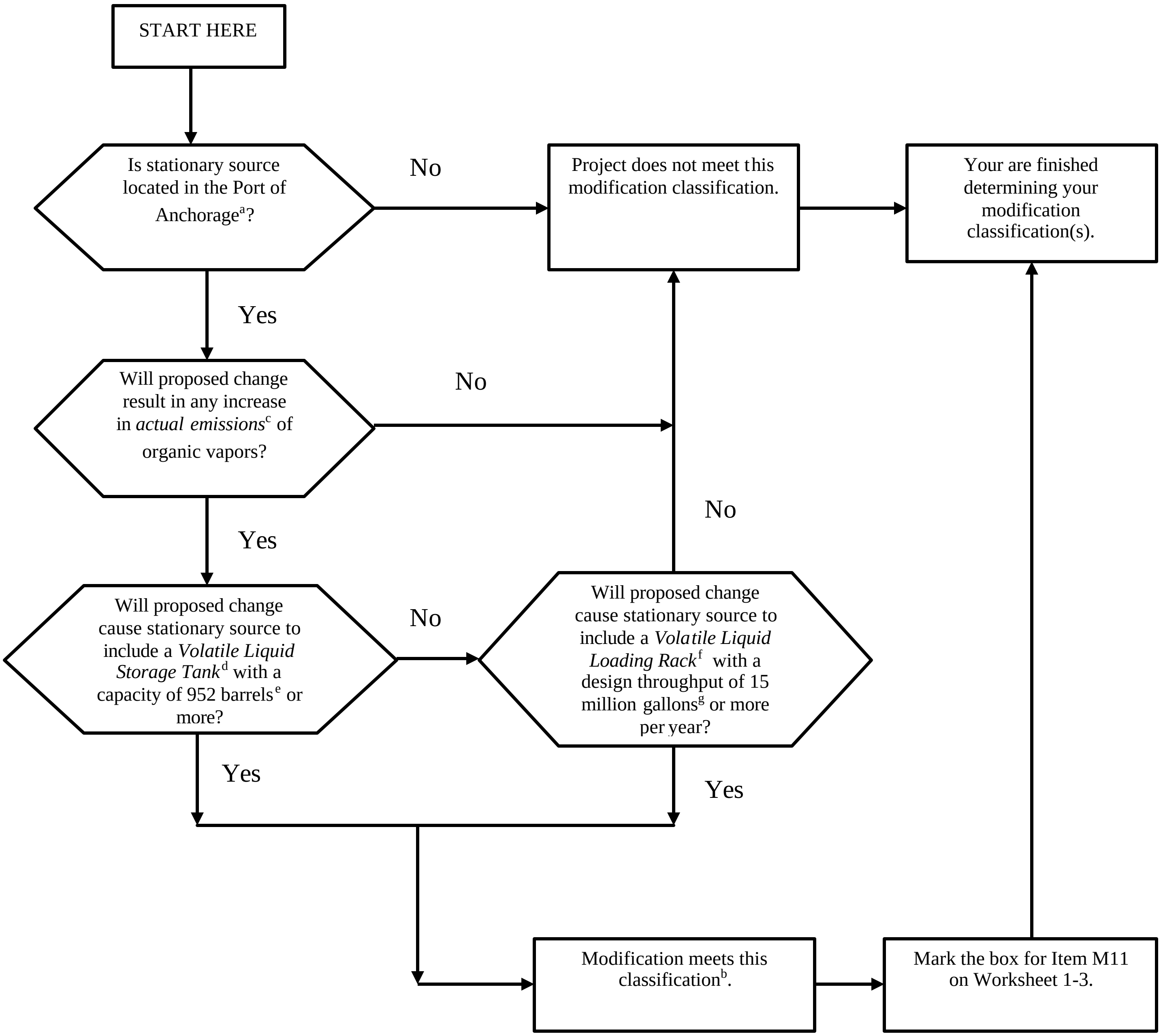
MODIFICATIONS M10a AND M10b
HAZARDOUS AIR POLLUTANT MAJOR MODIFICATION



[a] As defined in 18 AAC 50.910.
[b] As defined in 18 AAC 50.990(45). A list of *hazardous air pollutants* are provided in Table 1-4 of this document.
[c] As specified in 18 AAC 50.300(h)(10).

Flowchart 1-25

MODIFICATION M11
PORT OF ANCHORAGE MODIFICATION



[a] A complete description of the Port of Anchorage is in the state air quality control plan adopted by reference in 18 AAC 50.030. See Section 1.1.3 of this document.
[b] As specified in 18 AAC 50.300(h)(11).
[c] As defined in 18 AAC 50.910.
[d] As defined in 18 AAC 50.990(102).
[e] 952 barrels is equivalent to 40,000 gallons.
[f] As defined in 18 AAC 50.990(101).
[g] 15 million gallons is equivelent to 357,143 barrels.

2.0 EMISSION CALCULATIONS

To support a permit application, emission calculations are used for two general purposes:

- To determine stationary source and modification classifications and whether a permit is needed; and
- Once you know you need a permit, to help prepare the application.

Emissions are calculated either as *potential to emit* or as *actual emissions*. Table 2-1 lists purposes and kinds of calculations needed to support a permit application.

Table 2-1
EMISSION CALCULATIONS THAT SUPPORT AN APPLICATION

Purpose	Potential or Actual Emission Calculations	Sources Included in Calculations
Determining Classifications		
Classifications for a new stationary source	Potential to Emit	Stationary
Classifications for a modification	Potential to Emit and Actual Emissions	Stationary
Preparing an Application		
Determining whether particular regulations apply to a specific emission unit or to an entire stationary source	Potential to Emit (unless otherwise specified)	Stationary
Showing whether emissions units will comply with emission standards	Maximum emission rates in units the same as the emission standard	Stationary
Determining whether an ambient air quality analysis is required with the application for a new stationary source	Allowable emissions	Stationary, fugitive emissions, nonroad engines
Demonstrating compliance with the Alaska Ambient Air Quality Standards (AAAQS) and Prevention of Significant Deterioration (PSD) Increments	Potential to Emit	Stationary, fugitive emissions, nonroad engines, possibly other mobile sources. May need to include neighboring sources.

Emission calculations are prepared for a specific time interval (e.g., annual, or some other time period to match a short-term ambient standard or a permit limit).

The remainder of this section addresses the following:

- When to include nonroad engines and other mobile source emissions in the calculations;
- How to calculate *potential to emit*;
- How to calculate an increase in *actual emissions* from a modification to an existing stationary source. (The increase in *actual emissions* is used to determine whether certain modification classifications apply.);
- Different approaches that can be used to estimate emissions;
- Basic procedures to develop an emission inventory; and
- Common conversion factors.

2.1 Internal Combustion Engine Emissions

For determining stationary source or modification classifications, you must calculate only the emissions from all stationary sources. For other purposes, you may need to include in your calculations the emissions from *nonroad engines* and other mobile sources.

Equipment powered by internal combustion (I.C.) engines may be classified as stationary sources or mobile sources, which include *nonroad engines*. Nonroad engines are internal combustion engines that may be used in the same way and for the same purposes as stationary engines. But they are considered mobile sources because they are moved from place to place, or are intended to be moving while in use. The criteria for stationary and mobile I.C. engines are described below:

- **Stationary Sources:** Equipment powered by I.C. engines that are stationary while in operation (e.g., permanent fire water pump) **and** that will remain at a location for more than 12 consecutive months.

- **Mobile Sources:**
  - **Motor Vehicles:** Any self-propelled vehicle designed for transporting persons or property on a street or highway. Section 202 of the Clean Air Act (CAA) establishes emission standards for motor vehicles and motor vehicle engines. Section 216 of the CAA defines a motor vehicle as *"any self-propelled vehicle designed for transporting persons or property on a street or highway."*

  - **Nonroad Engines:** Nonroad engines are a special type of mobile source and are defined in 40 Code of Federal Regulations (C.F.R.) Part 89.2 as follows:

    (1) Except as discussed in paragraph (2) of this definition, a nonroad engine is any internal combustion engine:

    (i) In or on a piece of equipment that is self-propelled or serves a dual purpose by both propelling itself and performing another function (such as garden tractors, off-highway mobile cranes and bulldozers); or

    (ii) In or on a piece of equipment that is intended to be propelled while performing its function (such as lawnmowers and string trimmers); or

    (iii) That, by itself or in or on a piece of equipment, is portable or transportable, meaning designed to be and capable of being carried or moved from one location to another. Indicia of transportability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform.

    (2) An internal combustion engine is not a nonroad engine if:

    (i) the engine is used to propel a motor vehicle or a vehicle used solely for competition, or is subject to standards promulgated under section 202 of the Act; or

    (ii) the engine is regulated by a federal New Source Performance Standard promulgated under section 111 of the Act; or

    (iii) the engine otherwise included in paragraph (1)(iii) of this definition remains or will remain at a location for more than 12 consecutive months or a shorter period of time for an engine located at a seasonal source. A location is any single site at a building, structure, facility, or installation. Any engine (or engines) that replaces an engine at a location and that is intended to perform the same or similar function as the engine replaced will be included in calculating the consecutive time period. An engine located at a seasonal source is an engine that remains at a seasonal source during the full annual operating period of the seasonal source. A seasonal source is a stationary source that remains in a single location on a permanent basis (i.e., at least two years) and that operates at that single location approximately

> *three months (or more) each year. This paragraph does not apply to an engine after the engine is removed from the location."*

Examples of equipment that **could be** powered by *nonroad engines* (provided they meet the definition provided above from 40 C.F.R. 89.2) include welders, manlifts, cranes, compressors, generators, drills, light plants, pumps, backhoes, graders, and front-end loaders. Table 2-2 provides examples of what may or may not be considered a *nonroad engine*.

Table 2-2

NONROAD ENGINE DETERMINATIONS

Type of Engine	Considered Nonroad Engine?
An engine located on a barge that has been towed to its destination. The engine will remain at this location for 18 consecutive months.	No – Although the engine meets the criteria specified in 40 C.F.R. 89.2(1)(iii), this is superceded by the requirements of 40 C.F.R. 89.2(2)(iii). The engine can be considered a nonroad engine only if it will remain at this location for no more than 12 consecutive months.
An engine located on a barge that is self-propelled. The engine will remain at this location for 18 consecutive months.	Yes – Because the barge is self-propelled, the engine meets the criteria specified in 40 C.F.R. 89.2(1)(i) and is therefore not subject to the 12-month limit specified in 40 C.F.R. 89.2(2)(iii).
An engine located on a crane.	Yes if either the crane is self-propelled, or the engine moves with the crane while it operates. 40 C.F.R. 89.2(1)(i), (ii)

2.2 How to Calculate Potential to Emit

See Section 1.1.2 for the definition of *potential to emit*. The *potential to emit* must represent the maximum potential emissions from your stationary source.

In general, *potential to emit* must be calculated as follows:

- Using the maximum capacity of the emission unit (e.g., manufacturer ratings such as horsepower [hp] for an engine or million British thermal units per hour [MMBtu/hr] for a boiler);

- Using continuous operation of the emission unit (i.e., 24 hours per day, 365 days per year unless an enforceable limit applies); and
- Applying pollutant control efficiencies if the emission unit uses air pollution control equipment.

The 2003 amendments to AS 46.14 have changed the definition of *potential to emit* by giving the term the same definition as in the federal PSD program (40 C.F.R. 51.166(b)). This means that the definition is subject to the same guidance as the federal program, such as the guidance for emergency generators.[1] This guidance allows the *potential to emit* calculation for emergency generators, whose sole function is to provide back-up power when electric power from the local utility is interrupted, to be based on the amount of time utility power is expected to be unavailable, and the amount of time needed for maintenance.

For calculating *potential to emit*, the following sections describe:

- The requirements for using enforceable limits;
- When to include *fugitive emissions*; and
- When to included emissions from *nonroad engines*.

2.2.1 Using Enforceable Limits for Potential to Emit Calculations (Allowable Emissions)

If the emission unit has or will have an approved state or federal limitation (such as a permit requirement that is federally enforceable) on the capacity, operating hours, or type of material combusted, processed, or stored for an emission unit, then the approved limitations can be used in the *potential to emit* calculations. The key is that the limitations must be enforceable.

For example, if you have an I.C. engine that is not covered by EPA guidance such as that for emergency generators, and you plan to operate it only 4,500 hours per year, you must either:

- Calculate your *potential to emit* using continuous operation (i.e., 8,760 hours per year), or
- Take a permit limit to restrict the hours of operation.

[1] September 6, 1995 memorandum from John S. Seitz to EPA regional air directors.

Reductions of emissions based on the effect of pollution control equipment or upon limitations on the capacity of an emission unit to emit an air pollutant must be verifiable through monitoring, reporting, and record keeping, as required by the department [18 AAC 50.210]. Reductions of emissions cannot be optional. Reductions must be [18 AAC 50.210(a)]:

1. Necessary to comply with an emission standard established under 18 AAC 50;
2. Authorized by 18 AAC 50.225 (Owner-Requested Limits) or 18 AAC 50.230 (Pre-Approved Limits); or
3. Based on terms and conditions established in a construction or operating permit issued under 18 AAC 50 that:
    - Call for the installation and maintenance of controls to reduce emissions to a specified rate or level; or
    - Limit operation or production over a specified period and for which compliance with the terms and conditions can be determined at least monthly.

The result of calculating emissions based on existing construction permit conditions and/or other federally enforceable limitations is known as *allowable emissions* [18 AAC 50.990(7)].

2.2.2 When to Include Fugitive Emissions in Potential to Emit Calculations

When calculating *potential to emit* to determine whether a permit is required, you are not always required to include *fugitive emissions*. *Fugitive emissions* are defined as:

> "*emissions of an air contaminant that could not reasonably be emitted from a contaminant outlet.*" [18 AAC 50.990(42), AS 46.14.990(13)]

In essence, *fugitive emissions* are emissions that do not pass through a stack or vent. Examples of *fugitive emissions* include: emissions from valves, flanges, and relief valves (sources of fugitive VOC emissions); and particulate emissions from dirt piles.

To determine if your source requires a permit, you must include *fugitive emissions* of the following air pollutants in the *potential to emit* calculation if the emissions can be quantified through existing data or methods [18 AAC 50.210(b)]:

- All *hazardous air pollutants* (see Table 1-4 in Section 1 for a list of *hazardous air pollutants*);
- For a stationary source type listed in Table 1-2 of Section 1 (PSD Major Sources with a 100 ton per year threshold), all *regulated air pollutants* from emission units that comprise the source type; and
- For an affected facility regulated under the New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations as of August 7, 1980, all air pollutants regulated for that affected facility. See Sections 5.1 and 5.2, respectively, for a description of the NSPS and NESHAP regulations.

To do an air quality impact analysis, you must include all fugitive emissions if they can be quantified.

2.2.3 When to Include Nonroad Engine Emissions in Potential to Emit Calculations

Nonroad engines are described in detail in Section 2.1. Do not include the emissions of *nonroad engines* in calculations to determine the classification of a new stationary source or modification. [18 AAC 50.100]

However, all sources of emissions that affect ambient air must be evaluated in the air quality impact analysis. Include emissions from *nonroad engines* for:

- Calculating whether you need to do an air quality impact analysis under 18 AAC 50.310(n)(1); and
- Demonstrating compliance with the Alaska Ambient Air Quality Standards (AAAQS) and Prevention of Significant Deterioration (PSD) increments.

Calculate allowable emissions to find if an air quality analysis is needed. Demonstrations of compliance with ambient air quality standards and increments is based on short term emissions rates that are usually calculated from *potential to emit* – see 40 C.F.R. 51, Appendix W.

2.3 How to Calculate an Increase in Actual Emissions

See Section 1.1.2 for the definition of *actual emissions*.

Note: If your source has an *electric utility steam generating unit*, then the special conditions of 18 AAC 50.910(b) apply. (See Section 2.3.2)

2.3.1 Emission Units Other Than Electric Utility Steam Generating Units

For emission units that are not part of an *electric utility steam generating unit*, calculate an increase in *actual emissions* as follows:

1. For each emission unit and each *regulated air pollutant* emitted from the stationary source, calculate the *actual emissions* (in TPY) from the source for the two most recent years (24 months) of normal operation. For example, if you are making a modification in the year 2003, then you should calculate the actual emissions from your source for the prior 24 months (years 2001 and 2002), assuming that operations were normal during those years.

   Calculate the average emissions for the two most recent years (24 months) of normal operation. For the example listed above, this would be the average emissions for the years 2001 and 2002.

   For each emission unit at the stationary source:

   - Use the actual, rather than the maximum, capacity of the emission unit;
   - Use the actual operation of the emission unit, rather than continuous operation (unless the emission unit actually operated at a continuous rate); and
   - Apply pollutant control efficiencies if the emission unit used air pollution control equipment.

   In some cases, the two most recent years may not be representative of normal operations. You can use a more representative period if you get approval from the department.

2. Calculate the *potential to emit* from your stationary source, including the proposed modification. (See Section 2.2.)

3. Subtract the *actual emissions* in Item 1 from the *potential to emit* in Item 2 to get the increase in *actual emissions*.

2.3.2 Electric Utility Steam Generating Units

If your source has an *electric utility steam generating unit*, then the special conditions of 18 AAC 50.910(b) apply. For an *electric utility steam generating unit*, you can calculate the future *actual emissions* for the unit as expected actual emissions (rather than *potential to emit* if the change does not result in an emissions increase from the unit). To use this method, calculate the change in *actual emissions* as follows:

1. For each *regulated air pollutant* emitted from the *electric utility steam generating unit*, calculate the *actual emissions* (in TPY) from the source for the two most recent years (24 months) of normal operation. (See Item 1 in Section 2.3.1.)

   In some cases, the two most recent years may not be representative of normal operations. You can use a more representative period if you get approval from the department.

2. For each *regulated air pollutant* emitted from the *electric utility steam generating unit*, calculate the *actual emissions* (in TPY) based on the expected, future annual emissions from the unit after it is modified. To do this, you should:

   - Use the expected, future actual capacity of the emission unit;
   - Use the expected, future actual operation of the emission unit; and
   - Apply pollutant control efficiencies if the emission unit will have air pollution control equipment.

   The expected, future actual capacity and operation of the unit can be estimated from the historical capacity and operation of the unit as well as available information about the unit's likely post-change capacity and operation.

3. Subtract the *actual emissions* in Item 1 from the expected *actual emissions* in Item 2 to get the increase in *actual emissions.*

To verify that the change does not result in an emissions increase, you will be required to maintain information demonstrating that the physical or operational change did not result in an emissions increase. You must submit this information to the department annually for 5 years (unless the department determines that a longer period up to 10 years is more appropriate).

2.3.3 When to Include Fugitive Emissions in Actual Emissions Calculations

Actual *fugitive emissions* should be estimated in cases where a comparison will be made between an *actual emission* inventory and a *potential to emit* emission inventory that includes *fugitive emissions*. For example, when evaluating the net emission increase to determine whether a potential modification would trigger PSD thresholds, you should include *fugitive emissions* in the calculation of *actual emissions* if *fugitive emissions* are included in the *potential to emit* calculation.

2.3.4 When to Include Nonroad Engine Emissions in Actual Emissions Calculations

Nonroad engines are described in detail in Section 2.1. Do not include the emissions of *nonroad engines* in calculations to determine the classification of your project. [18 AAC 50.100]

2.4 Emission Calculation Methods

You can base emission calculations on either direct emission measurements or some type of estimation method. Direct measurement via stack testing and/or continuous emissions monitoring systems (CEMS) yield the most accurate data. However, these methods are often time-consuming and expensive, and can only be used for existing sources, not for proposed sources. Therefore, emission inventories typically rely on some form of estimation technique, such as:

- Material balance;
- Use of equipment vendor information;

- Emission factors;
- Models; and
- Engineering estimation.

Each of these emission calculation methods is discussed below. When preparing emission calculations for an entire stationary source, you may need to use different estimation techniques for different types of emission units or air pollutants.

2.4.1 Stack Test Data

For existing equipment at your stationary source, emissions can be estimated based on stack tests of a given unit's actual emissions. However, even these types of emission factors have their limitations. For example, a single stack test may not adequately characterize emissions from a given unit due to variations in equipment operation; thus, emissions calculated from one stack test may be suspect. Typically, multiple stack test results are needed to allow calculation of a statistically valid emission rate for a given process.

Another source of emission factor information is test data from an identical (or similar) existing unit. The same stack test uncertainties discussed above still apply; also, differences in emissions that often occur even between "identical" units can add uncertainty.

2.4.2 Continuous Emission Monitoring System (CEMS)

The most reliable estimates of actual, long-term emissions for a source are obtained from CEMS. CEMS continuously measure the concentration of a particular air pollutant from a source. This method can only be used for existing equipment installed with CEMS, and the CEMS must measure the air pollutant(s) of concern.

2.4.3 Material Balances

The material balance method of emission estimation equates the input of the pollutant of concern to the consumption, accumulation, and loss of that material in a process as a whole. Material balance calculations must account for all routes of inflow and outflow, as well as any accumulation or depletion of the substance in the equipment (including control devices) and through any chemical reaction.

The material balance approach provides reliable emission estimates only under certain circumstances. In general, material balances are typically considered appropriate for situations in which a high percentage of material is lost to the atmosphere (e.g., sulfur in fuel or solvent loss in an uncontrolled coating process). The material balance approach is a poor choice in cases in which material is consumed or chemically combined in the process, or in which losses to the atmosphere are a small part of the total process throughput.

2.4.4 Equipment Vendor Data

Emissions information from equipment vendors, particularly performance guarantees or actual test data from similar equipment, can be used to estimate emissions. If representative source-specific data are not available, equipment vendor data are most often considered the next best source of emissions data.

2.4.5 Emission Factors

An emission factor is an estimate of the amount of pollution emitted by a particular type of equipment as a function of some process parameter (or activity). Typically, emission factors are expressed as a ratio of the amount of a pollutant emitted per the amount of throughput. For example, an emission factor may be stated as the number of pounds of a particular pollutant emitted per pound of raw material used. For combustion equipment, emission factors are often stated in units of pounds per horsepower (lb/hp) or pounds per million Btu (lb/MMBtu).

Documented emission factors are based on actual measurements of pollutant emissions for certain processes within specific industries. As such, they are most accurate when used to predict emissions from a process that is similar to the process from which the factor was derived. It should also be noted that documented emission factors are typically averages obtained from data with a wide range of representation and varying degrees of accuracy. Therefore, emissions calculated using documented emission factors for a given source are likely to differ from that source's actual emissions. Because they are averages, emission factors will indicate higher-than-actual emissions for some sources and lower-than-actual emissions for others.

Recommended Emission Factors for Stationary Source Criteria Pollutants

Criteria pollutants include:

- Carbon monoxide (CO);
- Nitrogen oxides (NOx);
- Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10);
- Sulfur dioxide (SO_2);
- VOCs, as a precursor to ozone; and
- Lead.

The recommended data source for documented emission factors for criteria pollutants is the U.S. Environmental Protection Agency's (EPA) *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Volume I: Stationary Point and Area Sources, a document commonly known as AP-42. AP-42, Volume I addresses hundreds of stationary point, and area sources. The emission sources are categorized by industry, process, product, fuel, or other common denominators. AP-42 also provides the following for each source/process type:

- A description of the processes or activities from which emissions originate;
- Emission characteristics;
- Typical air pollution control devices; and
- Reference information describing how the emission factors were developed.

AP-42 is available on EPA's website at http://www.epa.gov/ttn/chief/ap42/.[2]

Recommended Emission Factors for Hazardous Air Pollutants

Hazardous air pollutants are listed in Table 1-4 of Section 1.

Although AP-42 contains some emission factors for hazardous air pollutants, the recommended data source for published emission factors for hazardous air pollutants is EPA's Factor

[2] This address may change. However, AP-42 can most likely be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link. Sections of AP-42 are continuously being developed, reviewed, and/or updated.

Information Retrieval (FIRE) Data System. FIRE is a consolidation of emission factors for criteria pollutants and hazardous air pollutants that includes emission factors from EPA documents such as AP-42 and the *Locating and Estimating Air Emission* series, factors derived from state-reported test data, and factors taken from literature searches. FIRE is set up to allow the user to search the database for emission factors on specific pollutants and specific source types. The database can also be searched using other criteria.

FIRE can be downloaded from EPA's website at http://www.epa.gov/ttn/chief/software/fire/index.html. [3]

Other Emission Factors

Emission factors for mobile sources can be found in EPA's Recommended Emission Factors for Mobile Sources (Criteria Pollutants), AP-42, Volume II. This can be downloaded from EPA's website at http://www.epa.gov/ttn/chief/ap42/.[4]

Other emission factors are available on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link.

In addition, certain trade or industry associations often pool resources to characterize emissions from a source category that is common to the industry.

2.4.6 Models

EPA has developed a number of models to calculate emissions from specific types of sources. Whether these models simply automate lengthy hand calculations from AP-42 or provide sophisticated calculations using a number of engineering assumptions, they can be very useful tools.

One of the most used EPA models is a computer program called TANKS, which is designed to estimate emissions of organic chemicals from storage tanks. The TANKS calculations are performed according to AP-42 equations. The user provides specific information concerning the

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[3] This address may change. However, FIRE can most likely be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link.

[4] This address may change. However, AP-42 can most likely be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link. Sections of AP-42 are continuously being developed, reviewed, and/or updated.

storage tank and its contents; the TANKS program then estimates the annual or seasonal emissions and produces a report. The EPA TANKS program is available on EPA's website at http://www.epa.gov/ttn/chief/software/tanks/index.html.[5]

Other EPA models to estimate emissions can also be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link.

2.4.7 Engineering Estimation

Engineering estimation is typically used to fill in data that cannot be easily measured or estimated using other techniques. Engineering estimates are based on known physical and chemical phenomena (e.g., the ideal gas law, Dalton's law, Henry's law), which are then quantified using accepted engineering calculations. These estimations are, of necessity, specific to the source being inventoried.

2.5 Basic Procedures to Prepare an Emission Inventory

When emission calculations must be made for an entire stationary source, we refer to the calculations as an emission inventory.

There are five basic steps in developing an emission inventory:

- Step 1: Identify Equipment With Air Emissions;
- Step 2: Identify Specific Air Pollutants Emitted;
- Step 3: Obtain Equipment-Specific Information;
- Step 4: Identify the Time Period for the Emission Inventory; and
- Step 5: Choose an Emission Inventory Approach;

2.5.1 Step 1: Identify Equipment With Air Emissions

The first step in preparing an emission inventory is to identify all of the stationary equipment that emits air pollutants. See Table 2-1 to determine which source types (i.e. stationary, nonroad,

[5] This address may change. However, TANKS can most likely be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link.

motor vehicles) must be included in your inventory. Types of equipment that emit air pollutants include, but are not limited to, I.C. engines, boilers, heaters, incinerators, turbines, flares, tanks, and spray coating booths. The emission inventory must include **all** stationary emission units. *Fugitive emissions* must be included as specified in Section 2.2.2.

Process schematics, building floor plans, and equipment drawings are good sources of information for identifying emission points. For existing stationary sources, a walk-through of the entire source should be conducted. Many undocumented emission points are likely to be discovered during the walk-through (e.g., small degreasing tanks or natural gas fired space heaters).

2.5.2 Step 2: Identify Specific Air Pollutants Emitted

Once you have identified the air emission units, identify the specific air pollutants emitted from each source. AP-42 is a good reference.

Table 2-3 shows some typical air pollutants emitted from several different types of emission units.

Table 2-3
EMISSION UNITS AND AIR POLLUTANTS

Emission Source	Typical Air Pollutant
I.C. Engines, Boilers, Heaters, Incinerators, Turbines, and Flares	CO, NOx, PM-10, SO_2, VOCs, Hazardous Air Pollutants
Tanks	VOCs and Hazardous Air Pollutants
Spray Coating Booths	PM_{10}, VOCs, and Hazardous Air Pollutants

2.5.3 Step 3: Obtain Equipment-Specific Information

To estimate emission rates you must obtain size and use information about each piece of equipment. The information necessary differs based on equipment type. Typical information needed for each piece of equipment includes:

- The type of equipment (e.g., I.C. engine, heater, turbine);

- Maximum equipment rating or capacity – e.g.:
  - hp for I.C. engines;
  - maximum firing rate in MMBtu/hr for boilers and heaters;
  - incinerator charging rate;
  - maximum equipment throughput capacity such as tons product per hour; and
  - vent exhaust throughputs;

  For ratings based on MMBtu/hr, specify whether this is higher or lower heating value – AP-42 emission factors are based on higher heating value;
- Type of fuel that will be burned or type of material that will be processed;
- Sulfur content (weight percent) and ash content of the fuel, as applicable;
- Schedule of operation (i.e., hours per day, days per week, weeks per year); and
- The type, if any, of air pollution control equipment installed on the equipment.

2.5.4 Step 4: Identify the Time Period for the Emission Inventory

To decide whether you need a permit, or whether you need to do an ambient air impact analysis, air emissions must be calculated in tons per year for all source and modification classifications.

To show compliance with an emission standard or ambient air quality standard, emission rates may need to be calculated on a short-term basis such as a 1-hour, 3-hour, 8-hour, or 24-hour period, depending on the averaging period of the standard.

2.5.5 STEP 5: Choose an Emission Inventory Approach

Section 2.4 describes several types of emission inventory approaches that can be used to estimate emissions. Several different emission inventory approaches may be used to develop a comprehensive emission inventory for an entire stationary source. For example, at a source that has fuel storage tanks, I.C. engines, boilers, and spray painting operations, the following emission inventory approaches may be used:

- Fuel storage tanks: EPA TANKS program;
- I.C. engines: Emission factors from AP-42;
- Boilers: Vendor emissions data; and
- Spray painting operations: Material balance.

Depending on available information, the basic priority in choosing an emission inventory approach for a particular emission unit should be as follows:

1. CEMS;
2. Stack test data;
3. Material balance (only if appropriate for emission source);
4. Vendor emissions data;
5. Emission factors and/or models; and
6. Engineering estimates.

Because CEMS data and stack test data are often not available and the material balance approach only applies to a few emission unit types, the two most common approaches used to estimate emissions are vendor emissions data and emission factor data. Ideally, equipment-specific emissions data provided by the equipment vendor should be used to assess air emissions from a specific piece of equipment. However, emissions data from the equipment vendor are not always available, in which case documented emission factors can be used.

The method used to assess air emissions depends on the particular type of source. Examples for some common source types using emission factors are presented below:

<u>I.C. Engines</u>

Engine Rating (hp) x Annual Hours of Operation (hrs/yr) x Emission Factor for Pollutant A (lbs/hp-hr) / 2000 lbs/ton = ____ TPY of Pollutant A

<u>Boilers/Heaters</u>

Boiler/Heater Firing Rate (MMBtu/hr) x Annual Hours of Operation (hrs/yr) x Emission Factor for Pollutant A (lbs/MMBtu) / 2000 lbs/ton = ____ TPY of Pollutant A

Appendix E also includes example emission calculations.

2.6 Common Conversion Factors

It may be necessary to use conversion factors when calculating emissions. For example, if you are calculating emissions from an I.C. engine, and the engine rating is in units of kW but the emission factor is in units of lb/hp-hr, then you will need to convert the engine rating from kW to hp-hr. Table 2-4 provides a list of common conversion factors that may be necessary when calculating emissions. A more complete list is given in EPA AP-42, Volume 1, Appendix A. (http://www.epa.gov/ttn/chief/ap42/).[6]

Table 2-4
COMMON CONVERSION FACTORS

Units	Conversion Factor
kilowatt (kW) to mechanical horsepower (hp)	Multiply 1 kW by 1.34 hp/kW
gram (g) to pound (lb)	Multiply 1 g by 0.0022 lbs/g
degrees Celsius (°C) to Kelvin (K)	Add 273.15 to °C
degrees Fahrenheit (°F) to °C	Subtract 32° from °F and multiply by 0.556 °C/°F
feet (ft) to meter (m)	Multiply 1 m by 3.28 ft/m
grains (gr) to pound (lb)	Multiply 1 gr by 0.000143 lbs/gr

2.7 References

U.S. Environmental Protection Agency. 1995. *Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources*. January.

U.S. Environmental Protection Agency. 1999. *FIRE: Factor Information Retrieval System*. May.

U.S. Environmental Protection Agency. 2000. *TANKS: Storage Tank Emissions Estimation Software. Version 4.0x*.

U.S. Environmental Protection Agency. Technology Transfer Network Clearinghouse for Inventories & Emission Factors website: http://www.epa.gov/ttn/chief/.

[6] This address may change. However, AP-42 can most likely be found on EPA's website under the Technology Transfer Network, Clearinghouse for Inventories and Emission Factors link. Sections of AP-42 are continuously being developed, reviewed, and/or updated.

PART II – HOW DO I PREPARE A COMPLETE APPLICATION?

3.0 APPLICATION PREPARATION

Once you know all of the classifications that apply to your project, you can begin to assemble your application. This section summarizes:

- The required information for new source and modification permit applications;
- How to assemble an application;
- The fee structure for processing an application; and
- How to certify an application.

3.1 Permit Application Content

The type of information included in a permit application depends on the source or modification classification. The major items that may be required for a permit application include the following:

- **Emission Calculations (Section 2).** Emission calculations must be completed for the air emission units at a stationary source. See Table 2-1 for the emission calculations you need to do to support your application.
- **State Regulations (Section 4).** 18 AAC 50 includes several State Implementation Plan (SIP)-approved regulations that apply to specific air emission units. If you have any emission unit types listed in Section 4, you must: (1) list the regulations that apply to each emission unit; and (2) show how you will comply with each regulation.
- **Federal Regulations (Section 5).** Section 5 identifies the Federal regulations that must be addressed in a construction permit application. If you have emission unit types listed in Section 5, you must : (1) list the regulations that apply to each emission unit; and (2) show how you will comply with each standard.
- **Air Quality Impact Analysis (AQIA) (Section 6).** An AQIA is used to demonstrate that the air pollutant emissions from a stationary source will not endanger the quality of the ambient air in the vicinity of a permitted source. As part of an AQIA, computer

models are used to calculate probable air pollutant concentrations that result from the source's emissions. The predicted concentrations from the computer model are then compared to air quality standards to determine whether air quality may be endangered. In some cases, an applicant may also need to collect air quality or meteorological data. Section 6 provides an overview of how to prepare an AQIA.

- **Best Available Control Technology (BACT) Analysis (Section 8).** BACT is an emission limitation that represents the maximum reduction achievable for a specific air pollutant, taking into account energy, environmental, and economic impacts. BACT is pollutant- and equipment-specific. A BACT analysis involves identifying an appropriate control technology that will control emissions of a specific air pollutant to a level that represents the maximum reduction achievable. Section 8 provides details on how to prepare a BACT analysis.
- **Lowest Achievable Emission Rate (LAER) Analysis (Section 8).** LAER is the rate of emission achieved under the most stringent emission limitation imposed in any state or any emission control that has been achieved in practice by a comparable source. LAER differs from BACT in that it does not consider energy, environmental, and economic impacts. LAER is also pollutant- and equipment-specific. Section 8 describes how to determine LAER.
- **Maximum Achievable Control Technology (MACT). (Section 8)** MACT is the maximum achievable control technology emission limitation. MACT standards apply to certain listed source categories (see Section 5). If you have a source in a category that is subject to an existing MACT standard, then you must comply with the standard. If a MACT standard for your source category has not been developed and your project is a major source of *hazardous air pollutants*, then you may have to develop a case-by-case MACT standard.[1] If you have a source subject to Case-By-Case MACT, you will need to work closely with the department on this action.
- **Air Quality Related Values (AQRV) (Section 9).** For a project that is PSD Major an applicant may be required to assess the impacts of the emissions from a source or modification on air quality related values (AQRVs). Typically, an evaluation of AQRVs will include an evaluation of the impact of emissions on noise, odor,

[1] If you have an existing source in a category that EPA has identified, your source is a major source of *hazardous air pollutants*, and EPA has missed their deadline for promulgating that standard by more than 18 months, you also may have to develop a MACT standard for your equipment. But this would not be done through a construction permit.

visibility, vegetation, and soils. Section 9 describes how to prepare an AQRV analysis.

- **Port of Anchorage (Section 10).** Special regulations may apply if the planned project is located in the Port of Anchorage and includes:

  - Volatile liquid storage tanks; or
  - Volatile liquid loading racks.

  These regulations are discussed in more detail in Section 10. Figure 1-11 in Section 1 shows the boundary of the Port of Anchorage. If your project meets the Port of Anchorage criteria described in Section 1.2.6 or 1.3.11, then the permit application must include the information required in the department's *Air Quality Compliance Certification Procedures for Volatile Liquid Storage Tanks, Delivery Tanks, and Loading Racks* (see Appendix F).

- **Requests Under Section 18 AAC 50.305 (Section 7).** You may request department approval in a construction permit for the following:

  1. Physical or operational limitations designed to provide actual emission reductions from an existing stationary source to offset an increase in allowable nonattainment air pollutant emissions;
  2. The emission of an air pollutant other than process emissions, products, of combustion, or materials introduced to control air pollutant emissions from a stack at a stationary source built or modified after November 1, 1982;
  3. Conditions that revise or rescind the terms and conditions of a prior construction permit; or
  4. A limitation that allows a source or modification to avoid classification under 18 AAC 50.300.

  Section 7 addresses the permit application requirements for the items listed above.

Table 3-1 identifies which of the items listed above are required for each classification.

Table 3-1
Permit Application Requirements for Specific Classifications

	Emission Calculations	State Regula-tions	Federal Regula-tions	AQIA	BACT	LAER	MACT	AQRV	Port of Anchorage	305 Limits
Stationary Source Classifications										
Ambient Air Quality Facility	✓	✓	✓	✓[b]			●			●
Prevention of Significant Deterioration (PSD) Major Source	✓	✓	✓	✓	✓		●	✓		●
Nonattainment Major Source	✓	✓	✓			✓	●			●
Major Stationary Source Near a Nonattainment Area	✓	✓	✓	✓[b]			●			●
Hazardous Air Pollutant Major Source	✓	✓	✓				●			●
Port of Anchorage Facility	✓	✓	✓				●		✓	●
Modification Classifications										
Becoming an Ambient Air Quality Facility - M1, Increase Over Current Allowable Emissions - M2, and Major Modification Near a Nonattainment Area - M9[a]	✓	✓	✓	✓			●			●
PSD Major Modifications - M3, M4a, and M4b[a]	✓	✓	✓	✓	✓		●	✓		●
Nonattainment Major Modifications – M5, M6, M7, and M8[a]	✓	✓	✓			✓	●			●
Hazardous Air Pollutant Major Modification - M10a and M10b[a]	✓	✓	✓				●			●
Port of Anchorage Modification - M11[a]	✓	✓	✓				●		✓	●

Note: A ✓ indicates this information is required. A ● indicates this information may be required if applicable to your source (see Section 3.1).

[a] See Worksheet 1-3 in Section 1 for a complete description of each modification type.

[b] An AQIA is only required for these classification types for the following pollutants:

- PM-10, if allowable emissions will exceed 15 tons per year (TPY);
- SO_2, if allowable emissions will exceed 40 TPY;
- NOx, measured as NO_2, if allowable emissions will exceed 40 TPY; and
- Lead, if allowable emissions will exceed 0.6 TPY.

The department has prepared forms to help applicants prepare construction permit applications. (The application forms are included in Appendix C.) These forms include the information listed in Table 3-1, as well as other necessary information such as source identification, emission unit-specific information, etc. The forms required for a complete permit application depend on the classification(s) that apply. Table 3-2 identifies which forms are required for each classification.

An Instruction Manual for completing each of the application forms is included in Appendix D. The Instruction Manual, as well as this Guidance Document, can be used to ensure that the application forms are accurately filled out.

Under 18 AAC 50.310(5) and (6), the department can request the following information of any permit applicant:

- An evaluation of the effect of the project's expected maximum emissions on the ambient air, including the ambient air quality and meteorological data used in the evaluation; and
- A plan for reducing emissions during an air episode.

Permit Application Checklists for each classification are provided in Appendix B to help you decide what forms you need. The sole purpose of these checklists is to identify the elements that must be included in a permit application. It is not necessary to submit these checklists as part of the permit application, but submitting the checklists may speed agency review.

Table 3-2
Permit Application Forms Required for Specific Classifications

	Permit Application Form[a]															
	A	B	C	D	E[c]	F	G	H[e]	I[f]	J[g]	K[h]	L[j]	M	N[k]	O	P[l]
Stationary Source Classifications																
Ambient Air Quality Facility	✓	✓	✓		●	✓	✓[d]	●	●	●	●	●		●		●
Prevention of Significant Deterioration (PSD) Major Source	✓	✓	✓		●	✓	✓	●	●	●	●	●		●		●
Nonattainment Major Source	✓	✓	✓		●	✓		●	●	●	●	●	✓	●		●
Major Stationary Source Near a Nonattainment Area	✓	✓	✓		●	✓	✓[d]	●	●	●	●	●		●		●
Hazardous Air Pollutant Major Source	✓	✓	✓		✓	✓		●	●	●	●	●		●		●
Port of Anchorage Facility	✓	✓	✓		●	✓		●	●	●	●	●		●	✓	●
Modification Classifications																
Becoming an Ambient Air Quality Facility – M1, **Increase Over Current Allowable Emissions – M2, and** **Major Modification Near a Nonattainment Area – M9[b]**	✓	✓	✓	✓	●	✓	✓	●	●	●	●	●		●		●
PSD Major Modifications – M3, M4a, and M4b[b]	✓	✓	✓	✓	●	✓	✓	●	●	●	●	●		●		●
Nonattainment Major Modifications – M5, M6, M7, and M8[b]	✓	✓	✓	✓	●	✓		●	●	●	●	●	✓	●		●
Hazardous Air Pollutant Major Modifications – M10a and M10b[b]	✓	✓	✓	✓	✓	✓		●	●	●	●	●		●		●
Port of Anchorage Modification M11[b]	✓	✓	✓	✓	●	✓		●	●	●	●	●		●	✓	●

Note: A ✓ indicates this form is required. A ● indicates this form may be required. See relevant footnotes to determine if a form is required.

[a] Form A: Retainer Invoice
Form B: Source Identification Form
Form C: Potential to Emit Summary
Form D: Actual Emissions Summary
Form E: Hazardous Air Pollutants
Form F: Emission Unit Information
Form G: Air Quality Modeling Checklist
Form H: Owner Requested Limits to Avoid Classification
Form I: Revisions and Revocations
Form J: New Source Performance Standards
Form K: National Emission Standards for Hazardous Air Pollutants
Form L: Storage Tank Information
Form M: Nonattainment Permitting
Form N: Offset Source
Form O: Port of Anchorage
Form P: Stack Injection

[b] See Worksheet 1-3 in Section 1 for a complete description of each modification type.

[c] Form E is required if your source or modification will result in an increase in emissions of *hazardous air pollutants* .

[d] Form G is only required for these classification types for the following pollutants:

- PM-10, if allowable emissions will exceed 15 tons per year (TPY);
- SO_2, if allowable emissions will exceed 40 TPY;
- NOx, measured as NO_2, if allowable emissions will exceed 40 TPY; and
- Lead, if allowable emissions will exceed 0.6 TPY.

[e] Form H is required if you are requesting specific permit limits to avoid a particular source or modification classification type.
[f] Form I is required if you are requesting that existing permit terms or conditions be revised or revoked.
[g] Form J is required if your source or modification has an emission source subject to a New Source Performance Standard.
[h] Form K is required if your source or modification has an emission source subject to a National Emission Standard for Hazardous Air Pollutants.
[j] Form L is required if your source or modification includes a storage tank.
[k] Form N is required if your source or modification will be reducing emissions of a nonattainment air pollutant so that another source can increase emissions of the same nonattainment air pollutant.
[l] Form P is required if you will be introducing into a stack materials other than process emissions, products of combustion, or materials introduced to control air pollutant emissions.

3.2 Permit Application Assembly

The basic steps to assemble an application are:

1. Fill out the appropriate application forms (included in Appendix C);
2. Ensure that all relevant information is attached to the appropriate application forms;
3. Assemble the application as specified in the Instruction Manual;
4. Attach a check for the retainer amount to the first page of the application;
5. Certify the application by obtaining the notarized signature of the *responsible official*;
6. Include your completed Alaska Coastal Management Program Coastal Project Questionnaire if your stationary source is located where it will affect a Coastal Zone; and
7. Mail the application (along with retainer check and certification statement) to:

   Department of Environmental Conservation
   Air Permits
   410 Willoughby Avenue, Suite 303
   Juneau, AK 99801

3.3 Fees and Retainers

The State of Alaska funds its permit program by charging service fees for processing permit applications. The department charges an hourly rate to cover the staff time spent processing a permit application. Because processing time will vary, this method means that there is no set fee for obtaining a permit. Applications that require more staff hours will cost more than those that require fewer staff hours. Complex applications that require a variety of analyses and/or demonstrations will generally cost more than applications that require fewer analyses and/or demonstrations. The current service fee as specified in 18 AAC 50.400 is $78 per hour.

A retainer for service must be submitted with each permit application. The required retainer amounts are listed in Table 3-3.

Table 3-3
PROJECT RETAINERS[a]

Classification Type	Retainer Amount
PSD Major Source and Modifications M3, M4a, and M4b	$13,000
Nonattainment Major Source and Modifications M5, M6, M7, and M8	$13,000
Hazardous Air Pollutant Major Source and Modifications M10a and M10b	$7,000
Emission Reductions at an Existing Stationary Source Requested to Offset Emission Increases at a Nonattainment Major New Source or Major Modification	$7,000
Major Stationary Source or Major Modification (M9) Near a Nonattainment Area	$4,000
Other Construction Permit Applications	$2,000

[a] As specified in 18 AAC 50.400

Service fees will initially be taken from the retainer amount. Fees over and above the retainer amount will be billed to the applicant. Unless the applicant requests a refund, any portion of a retainer that is not used during the development of a permit will be credited for paying emission or permit administrative fees that may be assessed in the future.

3.4 Certification

Every permit application, as well as amendments to permit applications, must include a certification statement and notarized signature of the *responsible official*. [18 AAC 50.310(c)(1)] The department will not begin processing an application until a certification is received.

3.4.1 Who May Certify a Permit Application?

As noted above, a *responsible official* must certify every permit application, as well as amendments to permit applications. The complete definition of the term *responsible official* is included in Appendix A. A *responsible official* is someone who has legal authority to make decisions for an organization such as:

- For a corporation, a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function. In addition, if all of the criteria listed below are met, a duly-authorized representative of that person can be considered the responsible official:
  - The representative is responsible for the source applying for a permit; and
  - The source employs more than 250 persons or has gross annual sales or expenditures exceeding $25 million in second quarter 1980 dollars; or
  - The department approves the delegation of authority in advance.
- For a partnership or sole proprietorship, a general partner or the proprietor; or
- For a public agency, a principal executive officer or ranking elected official.

3.4.2 Certification Statement and Signature

Under 18 AAC 50.205, the *responsible official's* signature must:

- Follow the statement:

  "*Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete*"; and

- Be notarized.

4.0 STATE REGULATIONS – APPLICATION FORM F

18 AAC 50 includes several State Implementation Plan (SIP)-approved regulations that apply to specific air emission sources. The following is a list of SIP-approved standards:

- Opacity (visible emissions);
- Particulate matter concentration;
- Sulfur dioxide;
- Other emission standards;
- Open burning;
- Wood-fired heating devices; and
- Ice fog.

When submitting an air quality control construction permit application, you must:

1) Identify the standards listed in this Section 4.0 that apply to your stationary source;
2) Identify the emission units they apply to; and
3) Show in your application how you will demonstrate compliance with the applicable standards.

The standards listed in this section do not apply to *nonroad engines*. See Section 2.1 for the definition of *nonroad engine*. [The department does have the authority to impose in-use limits, such as fuel consumption, fuel quality, and operating restrictions, on *nonroad engines* if these restrictions are necessary to comply with ambient air standards.]

4.1 Numerical Emission Standards

4.1.1 Opacity (Visible Emissions)

Opacity is a measure of the visible emissions from a stack. Opacity is measured by looking through smoke emitted from a stack and determining how much of the background is obscured because of the smoke. Opacity, or visible emissions, often occurs as a result of poor combustion.

Table 4-1 lists the emission unit categories for which opacity standards have been established, as well as the opacity standard for each category.

Table 4-1
OPACITY STANDARDS

Emission Unit Category	Visibility May Not Be Reduced By[a]
1. *Incinerator* (including air curtain incinerators)	a) More than 20 percent averaged over any 6 consecutive minutes [18 AAC 50.050] b) More than 20 percent averaged over any 6 consecutive minutes for a municipal wastewater treatment plant sludge incinerator [40 C.F.R. 52.70(c)(28)][b] More than 20 percent for a total of more than 3 minutes in any one hour for any other incinerator, including an air curtain incinerator [40 C.F.R. 52.70(c)(28)][b]
2. *Industrial Processes* and *Fuel-Burning Equipment*, except as provided in items 3 through 10 of this table	a) More than 20 percent averaged over any 6 consecutive minutes, except as provided in items 3 through 10 of this table [18 AAC 50.055] b) More than 20 percent for a total of more than 3 minutes in any one hour [40 C.F.R. 52.70(c)(28)][b]
3. *Fuel-Burning Equipment* in operation before November 1, 1982, and using more than 20 percent woodwaste as fuel	a) More than 30 percent averaged over any 6 consecutive minutes [18 AAC 50.055] b) More than 30 percent for a total of more than 3 minutes in any one hour [40 C.F.R. 52.70(c)(28)][b]
4. Urea Prilling Tower in operation before July 1, 1972	a) More than 55 percent averaged over any 6 consecutive minutes, nor more than 40 percent based on a daily 24-hour average of 5-second measurements by continuous opacity monitoring instrumentation approved by the department and conforming to Performance Specification Number 1 in 40 C.F.R. Part 60, Appendix B, adopted by reference in 18 AAC 50.040 [18 AAC 50.050] b) More than 55 percent for a total of more than 3 minutes in any one hour, nor greater than 40 percent, based on a daily 24-hour average of 5-second measurements by continuous opacity monitoring instrumentation approved by the department and conforming to Performance Specification Number 1 in 40 C.F.R. Part 60, Appendix B, adopted by reference in 18 AAC 50.040 [40 C.F.R. 52.70(c)(28)][b]
5. Asphalt Plant constructed or modified after June 11, 1973	20 percent or greater averaged over any 6 consecutive minutes [18 AAC 50.055]

Table 4-1
OPACITY STANDARDS

Emission Unit Category	Visibility May Not Be Reduced By[a]
6. Process emissions, other than from a pneumatic cleaner, at a *coal preparation facility* constructed or modified after November 1, 1982	20 percent or greater averaged over any 6 consecutive minutes [18 AAC 50.055]
7. A pneumatic cleaner, constructed or modified after November 1, 1982, at a *coal preparation facility*	10 percent or greater averaged over any 6 consecutive minutes [18 AAC 50.055]
8. Process emissions, other than from a kiln, at a portland cement plant constructed or modified after November 1, 1982	10 percent or greater averaged over any 6 consecutive minutes [18 AAC 50.055]
9. A kiln constructed or modified after November 1, 1982, at a portland cement plant	20 percent or greater averaged over any 6 consecutive minutes [18 AAC 50.055]
10. Coal-burning boiler that began operation before August 17, 1971	More than 20 percent for more than 3 minutes in any one hour, except for an additional 3 minutes in any one hour, if the criteria specified in 18 AAC 50.055 (a)(9)(A) – (D) are met [18 AAC 50.055]
11. Marine Vessels	Within 3 miles of the Alaska coastline, more than 20 percent, except as specified in 18 AAC 50.070 (1) – (4) [18 AAC 50.070]

[a] Visible emissions, excluding condensed water vapor, from the specified emission unit may not reduce visibility through the exhaust effluent by the amount shown for each emission unit type.

[b] These standards are the current SIP-approved standards. They also apply until the revised standards listed under item a) are approved by the EPA.

4.1.2 Particulate Matter Concentration

Particulate matter concentration is the mass of particulate matter in a volume of air. Particulate matter emissions occur from the following emission units or activities:

- Fuel burning equipment;
- Industrial processes; and
- Waste incineration.

Table 4-2 lists the types of emission units subject to particulate matter concentration standards, and the standards for each type.

Table 4-2
PARTICULATE MATTER CONCENTRATION STANDARDS

Emission Unit Category	Particulate Matter Concentration Standard
1. *Incinerator* with a rated capacity less than 1,000 pounds per hour	No limit [18 AAC 50.050]
2. *Incinerator* with a rated capacity greater than or equal to 1,000 but less than 2000 pounds per hour	0.15 grains per cubic foot of exhaust gas corrected to 12 percent CO_2 and standard conditions, averaged over 3 hours [18 AAC 50.050]
3. *Incinerator* with a rated capacity greater than or equal to 2,000 pounds per hour	0.08 grains per cubic foot of exhaust gas corrected to 12 percent CO_2 and standard conditions, averaged over 3 hours [18 AAC 50.050]
4. *Incinerator* that burns waste containing more than 10 percent wastewater treatment plant sludge by dry weight from a municipal wastewater treatment plant that serves 10,000 or more persons	0.65 grams per kilogram of dry sludge input [18 AAC 50.050]
5. *Industrial Processes* and *Fuel-Burning Equipment*, except as provided in items 6 through 10 of this table	0.05 grains[a], except as provided in items 6 through 10 of this table, and items 2 through 5 of Table 4-4 [18 AAC 50.055]
6. Steam Generating Plant fueled by: • Coal, and in operation before July 1, 1972; • Coal, and rated less than 250 million British thermal units (Btu) per hour heat input; or • Municipal wastes[b]	0.1 grains[a] [18 AAC 50.055]
7. Industrial Process in operation before July 1, 1972, except as provided in item 6 of this table	0.1 grains[a] [18 AAC 50.055]
8. Fuel-Burning Equipment in operation before November 1, 1982, and using more than 20 percent woodwaste as fuel	0.15 grains[a] [18 AAC 50.055]
9. Asphalt Plant constructed or modified after June 11, 1973	0.04 grains[a] [18 AAC 50.055]
10. Urea Prilling Tower	0.04 grains[a] [18 AAC 50.055]

[a] Particulate matter emitted from the specified emission unit may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over 3 hours, the amount shown for each emission unit type.
[b] This equipment may also be subject to the applicable incinerator standards listed in items 1 through 4 of this table.

4.1.3 Sulfur Dioxide

Sulfur dioxide (SO_2) emissions from fuel-burning equipment occur when the sulfur in the fuel is oxidized during combustion. Sulfur dioxide emissions are directly related to the sulfur content of the fuel. Sulfur dioxide emissions can also occur from certain industrial processes.

Table 4-3 lists the emission unit categories for which sulfur dioxide standards have been established, as well as the sulfur dioxide standard for each category.

Table 4-3
SULFUR DIOXIDE STANDARDS

Emission Unit Category	Sulfur Dioxide Standard
Industrial Processes and *Fuel-Burning Equipment*	Sulfur-compound emissions, expressed as sulfur dioxide, may not exceed 500 parts per million (ppm) averaged over a period of 3 hours, except as provided in items 2 through 5 of Table 4-4 [18 AAC 50.055]

4.1.4 Other Emission Standards

Other emission standards have been established for several specific source or emission unit categories. Table 4-4 lists the categories for which these emission standards have been established, as well as the emission standard for each.

If any of these standards apply to your stationary source, then you must identify these in your application and demonstrate how you will comply with the standard.

Table 4-4
OTHER EMISSION STANDARDS

Source or Emission Unit Category	Emissions Standard
1. Municipal Solid Waste Landfill (MSWLF) if: • The landfill design capacity, measured using megagrams or cubic meters, is 2.5 million megagrams or larger, or 2.5 million cubic meters or larger; • Construction, reconstruction, or modification of the MSWLF began before May 30, 1991; • The MSWLF accepted waste on or after November 8, 1987; and • Uncontrolled emissions of nonmethane organic compounds (NMOC) are 50 megagrams per year or more, computed in accordance with 40 C.F.R. 60.754, adopted by reference in 18 AAC 50.040(a)	Comply with standards specified in 18 AAC 50.052 (b) – (g).
2. At a *Petroleum Refinery* constructed or modified after November 1, 1982	For a catalytic cracking unit catalyst regenerator, comply with standards specified in 18 AAC 50.055 (d)(1). For a sulfur recovery plant rated at more than 20 long tons per day, comply with standards specified in 18 AAC 50.055 (d)(2). For fuel-burning equipment, comply with standards specified in 18 AAC 50.055 (d)(3).
3. At a *Coal Preparation Facility* constructed or modified after November 1, 1982	For a thermal drying unit, comply with standards specified in 18 AAC 50.055 (e)(1). For a pneumatic coal-cleaning unit, comply with standards specified in 18 AAC 50.055 (e)(1).
4. At a Portland Cement Plant constructed or modified after November 1, 1982	For a clinker cooler, comply with standards specified in 18 AAC 50.055 (f)(1). For a kiln, comply with standards specified in 18 AAC 50.055 (f)(2).
5. Stack Injection[a]	Comply with standards specified in 18 AAC 50.055(g).
6. Pulp mill	Comply with standards specified in 18 AAC 50.060.
7. *Volatile Liquid Storage Tank*	Comply with standards specified in 18 AAC 50.085.
8. *Volatile Liquid Loading Racks And Delivery Tank*	Comply with standards specified in 18 AAC 50.090.

[a] Release of materials other than process emissions, products of combustion, or materials introduced to control pollutant emissions from a stack at an emission unit constructed or modified after November 1, 1982, is prohibited unless approved in writing by the department.

4.2 Numerical Emission Standards – Showing That Your Emission Units Will Comply

If you have an emission unit to which a numerical standard applies, you must include information showing that it is capable of complying with the standard. Examples of support information you may use to document compliance include:

- Source test data;
- Manufacturer guaranteed data;
- Source test data from a similar unit;
- Mass balance (for sulfur compound emissions); or
- A published emission factor, such as one from EPA's *Compilation of Air Pollutant Emission Factors*, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources.

If the maximum particulate matter or sulfur compound emission rate (e.g., pounds per hour [lbs/hr]) and the exhaust flow rate (e.g., dry standard cubic feet per minute [dscf/min]) for the emission unit are known, you can use these parameters to calculate the pollutant concentration. Section 2 of this document describes how to calculate the emission rate. The exhaust flow rate can be obtained from source test data, manufacturer data, or by using EPA Method 19 in 40 C.F.R. 60. An example calculation using the maximum emission rate and the exhaust flow rate to demonstrate compliance with a concentration standard is included in Appendix E.

All of the sulfur contained in fuel will be converted completely to sulfur dioxide when burned. Therefore, if you know the sulfur content of the fuel being used by an emission unit, you may also use a mass balance calculation to demonstrate compliance with the sulfur dioxide standard. An example calculation using a mass balance methodology is included in Appendix E.

The most reliable information is source test data for the unit, or in some cases, mass balance. The least reliable is AP-42 data. AP-42 presents single emission factors taken from one or more source tests of equipment in the category, and may not accurately predict for a specific new unit. If the demonstration does not establish a high level of confidence that the emission unit will comply, then the permit will have to contain more rigorous performance test requirements.

4.3 Other State Standards

4.3.1 Open Burning

The term *open burning* means:

> "*the burning of a material that results in the products of combustion being emitted directly into the ambient air without passing through a contaminant outlet*." [18 AAC 50.990(62)]

Any person conducting *open burning* must comply with the standards listed in Table 4-5, except for *open burning* conducted in accordance with the following requirements [18 AAC 50.065]:

- Controlled burning as specified in 18 AAC 50.065(g);
- Firefighter training as specified in 18 AAC 50.065(h) or (i).

Table 4-5
OPEN BURNING STANDARDS

Item	Emission Standard
General Requirements	Comply with standards specified in 18 AAC 50.065(a)(1) – (5).
Black Smoke Prohibited without department authorization	Comply with standards specified in 18 AAC 50.065(b).
Toxic and Acid Gases and Particulate Matter Prohibited	Comply with standards specified in 18 AAC 50.065(c).
Adverse Effects Prohibited	Comply with standards specified in 18 AAC 50.065(d).
Air Quality Advisory	Comply with standards specified in 18 AAC 50.065(e).
Wood Smoke Control Areas[a]	Comply with standards specified in 18 AAC 50.065(f).

[a] A wood smoke control area is a geographic location where a wood-burning activity has resulted in two or more discontinuous 24-hour periods when the ambient exposures of PM-10 solely from this activity have reached or exceeded 150 micrograms per cubic meter of air. The Mendenhall Valley area of Juneau is designated a wood smoke control area. [18 AAC 50.025(b)]

If you plan on conducting open burning at your stationary source, you must identify this in your application and certify that you will comply with the standards.

4.3.2 Wood-Fired Heating Device

The term *wood-fired heating device* means:

> "*a device designed for wood combustion so that usable heat is derived for the interior of a building and includes wood-fired stoves, fireplaces, wood-fired cooking stoves, and combination fuel furnaces or boilers that burn wood, but does not include a device that is primarily a part of an industrial process and incidentally provides usable heat for the interior of a building*." [18 AAC 50.990(105)]

A person may not operate a *wood-fired heating device* as specified below [18 AAC 50.075]:

- In a manner that causes black smoke;
- In a manner that causes visible emissions that exceed 50 percent opacity for more than 15 minutes in any one hour in an area for which an air quality advisory is in effect under 18 AAC 50.245; or
- In an area for which the department has declared an air quality episode under 18 AAC 50.245.

Additionally, in the Mendenhall Valley wood smoke control area identified in 18 AAC 50.025(b), a person may not violate or cause a violation of a provision of the Code of the City and Borough of Juneau, Alaska, Chapter 36.40, as amended by the provisions of the Ordinance of the City and Borough of Juneau, Alaska, Serial No. 91-52, adopted by reference in 18 AAC 50.030.

If you have wood-fired heating devices at your stationary source, you must identify this in your application and certify that you will comply with the standards.

4.3.3 Ice Fog Standards

The department will, in its discretion, require a person who proposes to build or operate an industrial process, fuel-burning equipment, or incinerator in an area of potential ice fog to obtain a permit and to reduce water emissions. [18 AAC 50.080]

Nothing is required in your initial permit application for compliance with ice fog standards; however, as noted above the department may include specific requirements as part of your permit.

5.0 FEDERAL REGULATIONS – APPLICATION FORM F

This section addresses the following Federal regulations from the Clean Air Act (CAA):

- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAPs); and
- Other Federal regulations adopted by the State of Alaska.

Federal regulations refer to each emission unit subject to NSPS and NESHAPs as an *affected facility*.

In 18 AAC 50.040, the department has adopted several of these Federal regulations and thus has the authority to administer the requirements of each adopted regulation. When preparing air quality control construction permit applications, you must:

- Identify which of these regulations apply;
- Identify the affected facilities they apply to; and
- Demonstrate that you can comply with the applicable regulations.

Not all of the Federal regulations described in this section have been adopted by the department. The department will adopt each of the regulations that we find applies to stationary sources in Alaska.

You do NOT need to list an NSPS or NESHAP (including MACT standards) in your construction permit application if the department hasn't yet adopted it by reference. But you must comply with the standards that apply under federal law, and you will need to list them in your **operating** permit application.

5.1 New Source Performance Standards (NSPS)

5.1.1 What are New Source Performance Standards?

NSPS regulations establish technology-based standards for criteria pollutant emissions from affected facilities in specific categories. Criteria pollutants include:

- Carbon monoxide (CO),
- Nitrogen oxides (NO_X);
- Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10);
- Sulfur dioxide (SO_2);
- Volatile organic compounds (VOCs) as precursors to ozone formation; and
- Lead.

Some additional pollutants are also regulated including the following:

- Acid mist;
- Fluorides;
- Metals; and
- Total reduced sulfur.

NSPS regulations are equipment-based and apply to specific types of equipment regardless of whether an air quality control construction permit is required.

NSPS regulations apply to specific types of new air emission units, as well as to existing emission units that are modified or reconstructed. For NSPS purposes, the term "modification" means:

> "*any physical or operational change to an existing facility*[1] *which results in an increase*

[1] For NSPS purposes, "affected facility" means "*…with reference to a stationary source, any apparatus to which a standard is applicable.*" [40 C.F.R. 60.2] "Existing facility" means "*…with reference to a stationary source, any apparatus of the type for which a standard is promulgated in this part, and the construction or modification of which was commenced before the date of proposal of that standard; or any apparatus which could be altered in such a way as to be of that type.*" [40 C.F.R. 60.2] "Stationary source" means "*…any building, structure, facility, or installation which emits or may emit any air pollutant.*"

in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere." [40 C.F.R. 60.14]

Under 40 C.F.R. 60.14, the following are not modifications for NSPS purposes:

- *"Maintenance, repair, and replacement which the Administrator determines to be routine for a source category, subject to the provisions of paragraph (c) of section 60.14 and section 60.15;*
- *An increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on that facility;*
- *An increase in the hours of operation;*
- *Use of an alternative fuel or raw material if, prior to the date any standard under this part becomes applicable to that source type, as provided by section 60.1, the existing facility was designed to accommodate that alternative use. A facility shall be considered to be designed to accommodate an alternative fuel or raw material if that use could be accomplished under the facility's construction specifications as amended prior to the change. Conversion to coal required for energy considerations, as specified in section 111(a)(8) of the [Clean Air] Act, shall not be considered a modification;*
- *The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or is replaced by a system which the Administrator determines to be less environmentally beneficial; or*
- *The relocation or change in ownership of an existing facility."* [40 C.F.R. 60.14]

For NSPS purposes, the term "reconstruction" means:

"the replacement of components of existing facility to such an extent that:

1. *The fixed capital costs of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility; and*

2. *It is technologically and economically feasible to meet the applicable standards set forth in this part.*" [40 C.F.R. 60.15]

NSPS regulations are very specific in applicability. Therefore, it is not possible to describe the applicability criteria for all of the NSPS regulations. However, typical applicability criteria include:

- A list of the kinds of equipment that are regulated;
- The capacity or rating of the equipment; and
- The date that the equipment was constructed, re-constructed, or modified.

NSPS regulations are in 40 C.F.R. 60. Subpart A of 40 C.F.R. 60 specifies general NSPS provisions (e.g., performance testing, monitoring) that are common to NSPS sources. Not all sections of Subpart A may apply to a specific affected facility. So, in the permit application, it is important to identify the sections of Subpart A that do apply.

Subparts B and C of 40 C.F.R. 60 do not apply to facility operators. These subparts address emission guidelines for how states should regulate **existing** facilities. They do not establish requirements that apply directly to any stationary source. They therefore do not have any requirements that need to be included in an air quality control construction permit application. The remaining subparts of 40 C.F.R. 60 contain the facility category-specific NSPS regulations.

In 18 AAC 50.040(a), the department has adopted the NSPS regulations listed in Table 5-1. These NSPS regulations are administered by the department. Your construction permit application must identify:

- Each applicable NSPS the department has adopted by reference; and
- How you will demonstrate compliance with the applicable standard.

Table 5-1
NSPS REGULATIONS ADOPTED BY THE STATE OF ALASKA[a]

Subpart	Title
A	General Provisions, except 40 C.F.R. 60.9 (Availability of Information)
D	Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction is Commenced After August 17, 1971
Da	Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978
Db	Standards of Performance for Industrial/Commercial/Institutional Steam Generating Units
Dc	Standards of Performance for Small Industrial/Commercial/Institutional Steam Generating Units
E	Standards of Performance for Incinerators
Ea	Standards of Performance for Municipal Waste Combustors for Which Construction is Commenced After December 20, 1989 and on or Before September 20, 1994
Eb	Standards of Performance for Large Municipal Waste Combustors for Which Construction is Commenced After September 20, 1994 or for Which Modification or Reconstruction is Commenced After June 19, 1996
Ec	Standards of Performance for Hospital, Medical, and Infectious Waste Incinerators
F	Standards of Performance for Portland Cement Plants
I	Standards of Performance for Hot Mix Asphalt Facilities
J	Standards of Performance for Petroleum Refineries
K	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After June 11, 1973, and Prior to May 19, 1978
Ka	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984
Kb	Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984
L	Standards of Performance for Secondary Lead Smelters
N	Standards of Performance for Primary Emissions from Basic Oxygen Process Furnaces for Which Construction is Commenced After June 11, 1973
Na	Standards of Performance for Secondary Emissions from Basic Oxygen Process Steelmaking Facilities for Which Construction is Commenced After January 20, 1983
O	Standards of Performance for Sewage Treatment Plants
Q	Standards of Performance for Primary Zinc Smelters
R	Standards of Performance for Primary Lead Smelters
Y	Standards of Performance for Coal Preparation Plants
DD	Standards of Performance for Grain Elevators

Table 5-1

NSPS REGULATIONS ADOPTED BY THE STATE OF ALASKA[a]

Subpart	Title
GG	Standards of Performance for Stationary Gas Turbines
HH	Standards of Performance for Lime Manufacturing Plants
LL	Standards of Performance for Metallic Mineral Processing Plants
UU	Standards of Performance for Asphalt Processing and Asphalt Roofing Manufacture
VV	Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry
XX	Standards of Performance for Bulk Gasoline Terminals
GGG	Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries
JJJ	Standards of Performance for Petroleum Dry Cleaners
KKK	Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants
LLL	Standards of Performance for Onshore Natural Gas Processing: SO_2 Emissions
OOO	Standards of Performance for Nonmetallic Mineral Processing Plants
QQQ	Standards of Performance for VOC Emissions From Petroleum Refinery Wastewater Systems
UUU	Standards of Performance for Calciners and Dryers in Mineral Industries
WWW	Standards of Performance for Municipal Solid Waste Landfills
--	For sources at a facility required to have an operating permit under Alaska Statute (AS) 46.14.130(b)(1)-(3), the provisions of Subpart AAA (Standards of Performance for New Residential Wood Heaters), except that the operator of a wood stove may demonstrate compliance with 40 C.F.R. 60.532 by operating the wood stove in accordance with the permanent label required by 40 C.F.R. 60.536.
Appendix A	Test Methods
Appendix B	Performance Specifications
Appendix C	Determination of Emission Rate Change
Appendix D	Required Emission Inventory Information
Appendix F	Quality Assurance Procedures

[a] As specified in 18 AAC 50.040(a)

5.1.2 How Do I Determine if an NSPS Applies?

To determine whether an NSPS applies to an emission unit at your stationary source, you must review the applicability criteria defined in each individual NSPS subpart.

5.1.3 How Do I Demonstrate Compliance with an NSPS?

In your air quality control construction permit application, you must identify any NSPS regulations that apply to affected facilities at your stationary source, and then demonstrate how you will show compliance with the standard. Examples of support information to document compliance with the standard include the following:

- Source test data;
- Manufacturer guaranteed data;
- Source test data from a similar unit; or
- A published emission factor, such as one from EPA's *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Volume I: Stationary Point and Area Sources, a document commonly known as AP-42.

Appendix E includes a sample calculation using an air pollutant emission rate and exhaust flow rate to demonstrate compliance with an air pollutant concentration standard. The example is for SO_2. The same method can be used to demonstrate compliance with an NSPS. Section 2 of this document describes how to calculate an air pollutant emission rate. The exhaust flow rate can be obtained from source test data, manufacturer data, or by using EPA Method 19 in 40 C.F.R. 60.

5.2 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

5.2.1 What are National Emission Standards for Hazardous Air Pollutants?

Whereas NSPS regulations primarily address criteria pollutants, NESHAP regulations address hazardous air pollutants (HAPs). When the CAA was amended in 1970, EPA was directed to determine which HAPs to regulate and then to set appropriate standards to provide an "ample margin of safety to protect human health." This health-based approach turned out to be a slow process because the statutory criterion was difficult to define and even harder to implement.

Due to the ineffectiveness of the original NESHAP program, 1990 CAA amendments specified 188 compounds that must be regulated[2]. The amendments mandated that EPA set technology-based standards for source categories that emit HAPs. The list of HAPs is presented in Table 1-4

[2]The original list contained 189 compounds, but caprolactam was later de-listed.

in Section 1. These NESHAPs are usually referred to as Maximum Achievable Control Technology (MACT) standards.

The pre-1990 amendment NESHAP regulations, referred to simply as "NESHAPs," are in 40 C.F.R. 61. The post-1990 amendment NESHAP regulations – the "MACT Standards"— are in 40 C.F.R. 63.

The Part 61 NESHAPs apply to new and modified sources of air emissions. For Part 61 NESHAP purposes, the term "modified" means:

> *"any physical or operational change to a stationary source[3] which results in an increase in the rate of emission to the atmosphere of a hazardous pollutant to which a standard applies."* [40 C.F.R. 61.15]

Under 40 C.F.R. 61.15, the following are not modifications:

- *Maintenance, repair, and replacement which the Administrator determines to be routine for a source category;*
- *An increase in production rate of a stationary source, if that increase can be accomplished without a capital expenditure on the stationary source;*
- *An increase in the hours of operation;*
- *Any conversion to coal that meets the requirements specified in section 111(a)(8) of the [Clean Air] Act; or*
- *The relocation or change in ownership of a stationary source. However, such activities must be reported in accordance with section 61.10(c)."* [40 C.F.R. 61.15]

In 18 AAC 50.040(b), the department has adopted the NESHAP regulations listed in Table 5-2. These NESHAP regulations are administered by the department. Your construction permit application must identify:

- Each applicable NESHAP the department has adopted by reference; and
- How you will demonstrate compliance with that standard.

[3] For NESHAP purposes, "stationary source" is defined as *"any, building, structure, facility, or installation which emits or may emit any air pollutant which has been designated as hazardous by the Administrator."*

Table 5-2

NESHAP REGULATIONS (40 C.F.R. 61) ADOPTED BY THE STATE OF ALASKA[a]

Subpart	Title
A	General Provisions, except 40 C.F.R. 61.16 (Availability of Information)
E	National Emission Standard for Mercury
J	National Emission Standard for Equipment Leaks (Fugitive Emission Sources) of Benzene
V	National Emission Standard for Equipment Leaks (Fugitive Emission Sources
Y	National Emission Standard for Benzene Emissions from Benzene Storage Vessels
FF	National Emission Standard for Benzene Waste Operations
--	For sources at a facility required to have an operating permit under AS 46.14.130(b)(1)-(3), but not sources exempted from that requirement by 18 AAC 50.330, the Standard for Asbestos Demolition and Renovation under 40 C.F.R. 61.145 and, as they apply to activities subject to 40 C.F.R. 61.145, 40 C.F.R. 61.141, 40 C.F.R. 61.149(d)(1), 40 C.F.R. 61.150, 40 C.F.R. 61.152, and Appendix A to Subpart M (Interpretive Rule Governing Roof Removal Operations)
--	40 C.F.R. 61.154
Appendix A	National Emission Standards for Hazardous Air Pollutants, Compliance Status Information
Appendix B	Test Methods
Appendix C	Quality Assurance Procedures

[a] As specified in 18 AAC 50.040(b)

New and existing "major sources" in listed source categories (Table 5-3) are subject to the MACT standards. In addition, some non-major sources (i.e., area sources) are subject to MACT or other control requirements. Under MACT standard regulations, a "major source" is defined as:

> *"any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants."*

The MACT standards apply to new sources of air emissions, as well as to existing sources that are reconstructed. For MACT standards purposes, the term "reconstructed" means:

> *"unless otherwise defined in a relevant standard, means the replacement of components of an affected or a previously nonaffected source to such an extent that:*
>
> > *(1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new source; and*
> >
> > *(2) It is technologically and economically feasible for the reconstructed source to meet the relevant standard(s) established by the Administrator (or a State) pursuant to section 112 of the [Clean Air] Act. Upon reconstruction, an affected source, or a stationary source that becomes an affected source, is subject to relevant standards for new sources, including compliance dates, irrespective of any change in emissions of hazardous air pollutants from that source."* [40 C.F.R. 63.2]

In 18 AAC 50.040(c), the department has adopted the MACT standards listed in Table 5-3. Your construction permit application must identify:

- Each applicable MACT standard; and
- How you will demonstrate compliance with the applicable standard.

There are several MACT standards that have been proposed but are not yet in effect. If your project is major source of HAPs and includes HAP sources in categories for which EPA has not yet promulgate a MACT standard, you may be subject to case-by-case MACT. See Section 8.3 of this document for a discussion of case-by-case MACT.

Table 5-3

MACT STANDARDS (40 C.F.R. 63) ADOPTED BY THE STATE OF ALASKA[a]

Subpart	Title or Regulated Source Category
A	General Provisions, as follows: • 40 C.F.R. 63.1 - 40 C.F.R. 63.4; • 40 C.F.R. 63.5, except that 40 C.F.R. 63.5(b)(3), (d), and (e) do not apply except as described in (C) of this paragraph; • 40 C.F.R. 63.5(b)(3), (d), and (e) as they apply to a hazardous air pollutant major facility through a permit condition under 18 AAC 50.345(b); • 40 C.F.R. 63.6, with the clarification that the Federal Register notice or promulgation required under 40 C.F.R. 63.6(g) or (h)(9)(iii) will be satisfied by the adoption of an appropriate regulation under state law; and • 40 C.F.R. 63.7 - 40 C.F.R. 63.11.
B	Requirements for Control Technology Determinations for Major Sources in Accordance with Clean Air Act Sections, Sections 112(g) and 112(j), except that: • 40 C.F.R. 63.50 and 40 C.F.R. 63.54 are not adopted; • The requirements of 40 C.F.R. 63.51 - 40 C.F.R. 63.53, 40 C.F.R. 63.55, and 40 C.F.R. 63.56 apply to the owner or operator of a hazardous air pollutant major facility that includes one or more sources from a category or subcategory established under 42 U.S.C. 7412(c)(1) (Clean Air Act, sec. 112(c)(1)) for which the EPA administrator has failed to promulgate an emission standard within 18 months after the deadline established for doing so in 42 U.S.C. 7412(e) (Clean Air Act, sec. 112(e)); • The requirements of 40 C.F.R. 63.43(f) - (h) apply to the owner or operator of a facility that contains a source: a) That is a major source, as defined in 42 U.S.C. 7412(a) (Clean Air Act, sec. 112(a)); b) For which reconstruction is proposed; and c) For which a construction permit is not required under this chapter; and • In 40 C.F.R. 63.40 - 40 C.F.R. 63.44, “effective date of section 112(g)(2)(B)” means June 29, 1998.
D	Regulations Governing Compliance Extensions for Early Reductions of Hazardous Air Pollutants
M	National Perchloroethlyene Air Emission Standards for Dry Cleaning Facilities
N	Chromium Electroplating and Anodizing
Q	Industrial Process Cooling Towers

Table 5-3

**MACT STANDARDS (40 C.F.R. 63)
ADOPTED BY THE STATE OF ALASKA[a]**

Subpart	Title or Regulated Source Category
R	Gasoline Distribution Facilities: Bulk Gasoline Terminals and Pipeline Breakout Stations
T	Halogenated Solvent Cleaning
Y	Marine Tank Vessel Loading Operations
CC	Petroleum Refineries
DD	Off-Site Waste and Recovery Operations
GG	Aerospace Manufacturing and Rework Facilities
HH	Oil and Natural Gas Production Facilities
II	Shipbuilding and Ship Repair
JJ	Wood Furniture Manufacturing
KK	Printing and Publishing Industry
HHH	Natural Gas Transmission and Storage Facilities
LLL	Portland Cement Plants
Appendix A	Test Methods
Appendix B	Sources Defined for Early Reduction Provisions

[a] As specified in 18 AAC 50.040(c)

5.2.2 How Do I Determine if a NESHAP or MACT Standard Applies?

To determine whether a NESHAP or MACT standard applies to your stationary source, you must review the applicability criteria defined in each individual NESHAP or MACT subpart.

5.2.3 How Do I Demonstrate Compliance with a NESHAP or MACT Standard?

Examples of support information to document compliance with the standard include the following:

- Source test data;
- Manufacturer guaranteed data;
- Source test data from a similar unit; or

- A published emission factor, such as one from EPA's *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Volume I: Stationary Point and Area Sources, a document commonly known as AP-42.

Appendix E includes a sample calculation using an air pollutant emission rate and exhaust flow rate to demonstrate compliance with an air pollutant concentration standard. The example calculation is for demonstrating compliance with a sulfur dioxide concentration standard. This same method can be used to demonstrate compliance with a NESHAP or MACT standard. Section 2 of this document describes how to calculate an air pollutant emission rate. The exhaust flow rate can be obtained from source test data, manufacturer data, or by using EPA Method 19 in 40 C.F.R. 60.

5.3 Other Federal Regulations Adopted by the State of Alaska

In addition to some of the NSPS and NESHAP regulations, the State of Alaska has adopted a few other Federal regulations that must be addressed in an air quality control permit application. These regulations are specified in 18 AAC 50.040(d) and (e) and are listed below:

- **The provisions of 40 C.F.R. 82 (Protection of Stratospheric Ozone), revised as of July 1, 1997, are adopted by reference to the extent that they apply at a stationary source required to have an operating permit under AS 46.14.130(b) or 18 AAC 50.**

  Any stationary source that needs a construction permit also needs an air quality operating permit. Review the applicability criteria in 40 C.F.R. 82 to determine if these regulations apply to your stationary source.

  If you are subject to of 40 C.F.R. 82, then in your construction permit application:

  - Specify the requirements of 40 C.F.R. 82 that apply;
  - Identify the emission units the requirements apply to; and
  - Certify that you will comply with the provisions of 40 C.F.R. 82.

- **The requirements of 40 C.F.R. 52.70 through 40 C.F.R. 52.96 (Alaska's SIP), as revised as of July 1, 1999, as they apply to a stationary source classified under 18 AAC 50.325(b)(1) or (b)(2) [major operating permit sources], are adopted by reference.**

  40 C.F.R. 52.70 through 40 C.F.R. 52.96 specifies the standards approved by EPA as part of Alaska's State Implementation Plan (SIP). These standards may not always match the standards in 18 AAC 50. For example, if the department changes an emission standard in 18 AAC 50, the standard will differ from that in 40 C.F.R. 52.70 through 40 C.F.R. 52.96 until EPA approves the revised standard. If the standards in 18 AAC 50 and in 40 C.F.R. 52.70 through 40 C.F.R. 52.96 differ, you are required to comply with both standards. If your stationary source is subject to any of the requirements in 40 C.F.R. 52.70 through 40 C.F.R. 52.96, you must identify the requirement, and demonstrate how you will comply with the requirement.

6.0 AIR QUALITY IMPACT ANALYSIS – PSD MAJOR SOURCE OR MODIFICATION, AMBIENT AIR QUALITY FACILITY OR MODIFICATION, AND MAJOR SOURCE OR MODIFICATION NEAR A NONATTAINMENT AREA – APPLICATION FORM G

A construction permit cannot be issued unless the department is satisfied that air emissions associated with the permit request and the subsequent impacts to ambient air will not compromise applicable air quality standards. An Air Quality Impact Analysis (AQIA) is used to demonstrate that the air pollutant emissions from a stationary source will not cause or contribute to a violation of the ambient air quality standards or increments in the vicinity of a permitted project. An AQIA uses computer models to calculate probable air pollutant concentrations that result from source emissions. The predicted concentrations from the computer model are then compared to air quality standards to determine if air quality may be endangered. There are two types of air quality standards:

- Ambient Air Quality Standards, which are intended to protect human health and welfare; and
- PSD Increments, which are intended to prevent a significant deterioration of the air quality in a specific region.

The purpose of this section is to provide an overview of what an AQIA entails. Because an impact analysis is complex and site-specific, this section is not intended to provide a step-by-step procedure. Refer to the department's Ambient Modeling Procedures, for more detailed information and guidance on preparing an AQIA.

6.1 Who is Required to Conduct an AQIA

The project classification determines whether an AQIA is required. As the first step of the permit application process, you should have identified your classification. (See Sections 1.2 and 1.3.) You should have completed Worksheets 1-2 and 1-3, which can be used to quickly identify your project classification.

Table 6-1 identifies the project classifications needing an AQIA, and the air pollutants that the AQIA must address.

The department has the discretionary authority to request an AQIA for any project that requires a construction permit. [18 AAC 50.310(c)(5)]. For example, the department may request an AQIA for large sources for which impacts have not yet been assessed, or for projects with significant seasonal or operational variability.

Table 6-1

TYPES OF SOURCES AND AIR POLLUTANTS FOR WHICH AN AQIA MUST BE PERFORMED

Source Type	Air Pollutants For Which AQIA Must Be Performed
PSD Major Source and Modifications M3, M4a, and M4b[a] [18 AAC 50.310(d)(2)]	Each *regulated air pollutant* with an increase in actual emissions that exceeds a PSD significance threshold. See Table 1-5 in Section 1 for the PSD significance thresholds.
Ambient Air Quality Facility [18 AAC 50.310(n)(1)]	• Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10) emitted in an area classified attainment or unclassifiable for PM-10, if the proposed *allowable emissions* will exceed 15 tons per year (TPY); • Sulfur dioxide, if the proposed *allowable emissions* will exceed 40 TPY; • Nitrogen oxides, measured as nitrogen dioxide (NO_2), if the proposed *allowable emissions* will exceed 40 TPY; and • Lead, if the proposed *allowable emissions* will exceed 0.6 TPY.
Major Source Near a Nonattainment Area [18 AAC 50.310(g)]	• Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10) emitted in an area classified attainment or unclassifiable for PM-10, if the proposed *allowable emissions* will exceed 15 tons per year (TPY).
Modifications: – M1 (Becoming an Ambient Air Quality Facility), – M2 (Increase Over Current Allowable Emissions), or – M9[a] (Major Modification Near a Nonattainment Area) [18 AAC 50.310(n)(2)]	An increase in allowable emissions of: • PM-10; • Sulfur dioxide; • Nitrogen oxides, measured as NO_2, and • Lead

[a] Refer to Worksheet 1-3 for a description of modification types.

6.2 Ambient Air and Ambient Air Boundaries

The term *ambient air* means:

> *"that portion of the atmosphere, external to buildings, to which the general public has access."* [AS 46.14.990]

Every stationary source has what is known informally as an "ambient air boundary." An ambient air boundary divides ambient air from non-ambient air. When performing an AQIA, it is only necessary to consider areas that are outside your ambient air boundary. Typically, the ambient air boundary is the source's fence-line. In some cases, other types of physical barriers or natural features may be sufficient to restrict entry. In all cases, the key provision is that an ambient air boundary must be capable of barring the general public from the areas the applicant is claiming as non-ambient air. In situations where fencing is not practical, the use of signs, surveillance personnel, and surveillance logs may be needed to ensure this restriction of public access. A demonstration of the legal right to restrict access (e.g., land ownership or the transfer of rights from the landowners) usually is necessary to define an ambient air boundary. Ambient air boundaries are specific to a single source – that is, the air within the ambient air boundary of a source owned and operated by another person or corporation remains ambient air relative to your source.

If you have any questions about determining the appropriate ambient air boundary for your stationary source, you should consult with the department for assistance. As part of your modeling protocol (described in Section 6.6.4), you should identify your proposed ambient air boundary. This will allow the department to determine whether you have correctly identified your ambient air boundary.

6.3 Alaska Ambient Air Quality Standards

Federal regulations (42 United States Code [USC] 7401, et seq.; 40 Code of Federal Regulations (C.F.R.) 50 Subchapter C) define standards for permissible air pollutant concentrations that all ambient air is required to meet. Alaska State laws (based on the Federal laws) define the Alaska Ambient Air Quality Standards (AAAQS). The AAAQS are health-based standards that specify the maximum concentrations of air pollutants allowed in ambient air. Each AAAQS is in the form of a concentration and averaging time, and may define the number of times the standard may be exceeded during a given year. For instance, the daily AAAQS for PM-10 is 150 micrograms per cubic meter ($\mu g/m^3$) averaged over 24 hours. Instantaneous concentrations of PM-10 greater than 150 $\mu g/m^3$ are allowed, but the average concentration during any 24-hour period must not exceed 150 $\mu g/m^3$ more than once a year. Table 6-2 lists the AAAQS and their averaging times.

Table 6-2

ALASKA AMBIENT AIR QUALITY STANDARDS[a]

Pollutant	Concentration	Averaging Time	Allowed Annual Exceedances
Ammonia (NH_3)	2.1 mg/m^3	8-hour	1
Carbon Monoxide (CO)	10 mg/m^3	8-hour	1
	40 mg/m^3	1-hour	1
Lead (Pb)	1.5 $\mu g/m^3$	Quarterly	0
Nitrogen Dioxide (NO_2)	100 $\mu g/m^3$	Annual	0
Ozone (O_3)	235 $\mu g/m^3$	1-hour	Special[b]
PM-10	50 $\mu g/m^3$	Annual	0
	150 $\mu g/m^3$	24-hour	1
Reduced Sulfur Compounds (expressed as SO_2)	50 $\mu g/m^3$	30-minute	1
Sulfur Oxides (measured as SO_2)	80 $\mu g/m^3$	Annual	0
	365 $\mu g/m^3$	24-hour	1
	1300 $\mu g/m^3$	3-hour	1

a As specified in 18 AAC 50.010.

b The ozone standard is attained when the expected number of days in a calendar year with a maximum hourly average concentration above 235 $\mu g/m^3$ is less than or equal to one day.

Compliance with the AAAQS must be demonstrated at the stationary source's ambient air boundary. For a new or modified project, compliance with the AAAQS is based on the total estimated air quality, which is the sum of the ambient estimates resulting from modeled existing emission units, the measured background concentrations, and the modeled ambient impact caused by the applicant's proposed emissions increase (or net emissions increase for a modification) and associated growth.

6.4 PSD Increments

For areas in attainment with ambient air quality standards, in addition to the health-based AAAQS, Congress established maximum allowable increases, commonly referred to as "PSD Increments," to prevent significant deterioration of air quality. A PSD Increment is the maximum **increase** in a concentration that is allowed to occur above a baseline concentration for an air pollutant.

The baseline concentration is defined for each pollutant (and relevant averaging time) and, in general, is the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the ambient concentration increase from new pollution would exceed the applicable PSD Increment. Still, the air quality cannot deteriorate beyond the concentration allowed by the applicable AAAQS, even if not all of the PSD Increment is consumed. Section 6.4.1 provides guidance on how to determine the baseline concentrations near a stationary source.

Allowable PSD Increments have been established for specific types of areas. There are three area classifications associated with the PSD Increment requirements. Each classification differs in the amount of growth permitted before significant air quality deterioration would be deemed to occur. Class I areas have the smallest PSD Increments and thus allow only a small degree of air quality deterioration. Class II areas accommodate normal well-managed industrial growth. Class III areas would have the largest PSD Increments and thereby provide for a larger amount of development than either Class I or Class II areas, but there are no Class III areas in Alaska. Alaska does have four Class I areas. See Section 6.4.2.

6.4.1 Determining the Baseline Concentrations Near Your Stationary Source

Baseline concentrations vary depending on the region of the state and the baseline date. Table 6-3 shows the baseline dates by Air Quality Control Region and air pollutant. Figure 6-1 shows the location of each Air Quality Control Region. Once you have determined the baseline dates and region for your location, you should contact the department for help in determining your baseline concentration.

Table 6-3

BASELINE DATES[a]

Air Quality Control Region	Air Pollutant	Baseline Date
Cook Inlet Intrastate Air Quality Control Region	Nitrogen Dioxide (NO_2)	February 8, 1988
	Sulfur Dioxide (SO_2)	October 12, 1979
	Particulate Matter ≤ 10 microns (PM-10)	March 20, 1982
Northern Alaska Intrastate Air Quality Control Region	NO_2	February 8, 1988
	SO_2	June 1, 1979
	PM-10	November 13, 1978
South Central Intrastate Air Quality Control Region	NO_2	February 8, 1988
	SO_2	October 26, 1979
	PM-10	October 26, 1979
Southeast Alaska Intrastate Air Quality Control Region	NO_2	February 8, 1988
	SO_2	November 10, 1986
	PM-10	The baseline date has not been set.

[a] As specified in 18 AAC 50.020.

Figure 6-1 Air Quality Control Region Map

6.4.2 Area Classification

The PSD Increment allowed depends on an area's air quality classification. Table 6-4 shows the classifications for the State of Alaska. Figures 1-1 through 1-4 in Section 1 show the Class I areas in Alaska.

Table 6-4

AIR QUALITY CLASSIFICATIONS[a]

Classification	Geographic Area
Class I Areas	Denali National Park including the Denali Wilderness but excluding the Denali National Preserve
	Bering Sea National Wildlife Refuge designated as a National Wilderness Area
	Simeonof National Wildlife Refuge designated as a National Wilderness Area
	Tuxedni National Wildlife Refuge designated as a National Wilderness Area
Class II Areas	All other geographic areas in Alaska not classified Class I or Class III
Class III Areas	No areas in Alaska

[a] As specified in 18 AAC 50.015.

6.4.3 PSD Increments for Specific Air Quality Classifications

Increases in air pollutant concentrations above the baseline concentration must not exceed the PSD increments shown in Table 6-5. For any averaging period other than annual, the maximum allowable increase may be exceeded once per year at any one location. PSD Increments apply outside a stationary source's ambient air boundary.

Table 6-5

MAXIMUM ALLOWABLE INCREASES (PSD INCREMENT)[a]

Classification of Area	Air Pollutant	Averaging Period	Maximum Allowable Increase (μg/m^3)
Class I	Particulate Matter ≤ 10 microns (PM-10)	Annual arithmetic mean	4
		24-hour maximum	8
	Sulfur Dioxide (SO_2)	Annual arithmetic mean	2
		24-hour maximum	5
		3-hour maximum	25
	Nitrogen Dioxide (NO_2)	Annual arithmetic mean	2.5
Class II	PM-10	Annual arithmetic mean	17
		24-hour maximum	30
	SO_2	Annual arithmetic mean	20
		24-hour maximum	91
		3-hour maximum	512
	NO_2	Annual arithmetic mean	25
Class III	PM-10	Annual arithmetic mean	34
		24-hour maximum	60
	SO_2	Annual arithmetic mean	40
		24-hour maximum	182
		3-hour maximum	700
	NO_2	Annual arithmetic mean	50

[a] As specified in 18 AAC 50.020

6.5 Maximum Allowable Ambient Concentrations

After the baseline dates listed in Table 6-3, the maximum allowable ambient concentration of an air pollutant is the lesser of:

- The AAAQS concentration; or
- The baseline concentration plus the maximum allowable increase (PSD Increment). [18 AAC 50.020(c)]

In the Southeast Alaska Region the baseline date has not been set for PM-10. It is not necessary to analyze PM-10 emissions in that region for compliance with the increment unless the project requires PSD review for PM-10.

6.6 Overview of How to Prepare an AQIA

An AQIA typically involves:

- A preliminary analysis, potentially followed by a full impact analysis;
- An assessment of existing air quality, which may include ambient monitoring data and air quality dispersion modeling results; and
- Predictions, using dispersion modeling, of ambient concentrations that will result from the proposed project and associated growth.

Section 6.6.1 identifies the two phases of an AQIA: the preliminary analysis and the full impact analysis. Section 6.6.2 describes the requirements for assessing existing air quality. Section 6.6.3 describes the available EPA-approved dispersion models that may be used to perform the AQIA.

Section 6.6.4 describes the contents of a typical modeling protocol. The department strongly recommends that a modeling protocol be submitted to the department before performing an AQIA. The purpose of the protocol is to develop consensus with the department on the methods you will use to do the AQIA.

6.6.1 Overview of a Preliminary Analysis and Full Impact Analysis

An AQIA usually involves two distinct phases: 1.) a preliminary analysis and 2.) a full impact analysis.

Preliminary Analysis

The preliminary analysis is used to:

- Decide if you must do a full impact analyses for the pollutant;
- For a PSD Major Source or Modification, decide if you need to do pre-construction ambient monitoring (see Section 6.6.2); and
- Define the impact area a full impact analysis must consider.

A preliminary analysis evaluates only the changes in emissions from the proposed project. If your predicted ambient concentrations are below the significant impact levels (Table 6-6) at all locations, you do not need to do a full impact analysis for that pollutant.

For a PSD major project, model only pollutants emitted in the significant amounts given in Table 1-6. If your predicted concentrations are less than the thresholds in Table 6-7, you do not need to do PSD pre-construction monitoring.

Table 6-6

SIGNIFICANT IMPACT LEVELS[a]

Air Pollutant	Average Time				
	Annual	24-hr	8-hr	3-hr	1-hr
Sulfur Dioxide (SO_2)	1 $\mu g/m^3$	5 $\mu g/m^3$	-----	25 $\mu g/m^3$	-----
PM-10	1 $\mu g/m^3$	5 $\mu g/m^3$	-----	-----	-----
Nitrogen Dioxide (NO_2)	1 $\mu g/m^3$	-----	-----	-----	-----
Carbon Monoxide (CO)	-----	-----	500 $\mu g/m^3$	-----	2000 $\mu g/m^3$

[a] As specified in 18 AAC 50.310(d)(2).

Full Impact Analysis

You must do a full impact analysis for a pollutant if the preliminary analysis predicts an ambient concentration above a significant ambient impact level. A full impact analysis must consider emissions from:

- The proposed project;
- Existing emissions at the proposed project;
- Associated growth that accompanies the new activity at the proposed project: and
- Nearby sources expected to cause a significant concentration gradient.

When conducting a full impact analysis, the sources not explicitly included in the model (e.g., natural sources, area-wide sources, or distant sources) are accounted for by adding a background concentration representative of the air quality in the area. These background concentrations are then added to the ambient concentrations from the modeled emissions. This total ambient concentration (background concentration plus modeled concentration) is then compared to the

AAAQS. Impacts resulting from changes in emissions since the baseline date are compared to the PSD Increment.

The department recommends that you contact them to determine the background concentrations in the area of your proposed project, and to discuss which nearby sources should be modeled.

6.6.2 Ambient Air Quality Data

To assess the impacts to air quality from a proposed project, you must first assess the existing air quality near the proposed project. The department recommends that you contact them to determine background air pollutant concentrations.

Meteorological data for the area being modeled is typically required for all air dispersion models. The data must represent local conditions. Site-specific data are preferable to data collected elsewhere.

Additional Requirements for PSD Major Sources or Modifications

If your project is PSD Major, you may need to collect at least one year of ambient air quality monitoring data (for specific pollutants), and meteorological data if no other representative data is available. [18 AAC 50.310(d)(1)] **All ambient air monitoring data must be collected before preparing a permit application.** The monitoring data should represent at least the 12-month period immediately preceding the permit application.

The pollutant-specific ambient concentrations obtained from the monitoring data are used to determine whether the existing air quality violates or threatens to violate the AAAQS or PSD increments.

Because collecting ambient air quality data can delay receiving a permit, the department recommends that you contact us well in advance of any PSD project about the need to collect ambient air and meteorological data. 18 AAC 50.310(e) exempts you from collecting pre-construction ambient air quality data if:

1. Existing monitoring data for the area shows that existing concentrations are below the thresholds in Table 6-7; or
2. The project's predicted impacts are below the threshold concentrations in Table 6-7.

Table 6-7

AMBIENT AIR MONITORING THRESHOLD CONCENTRATIONS[a] FOR PSD MAJOR SOURCES AND MODIFICATIONS

Air Pollutant	Concentration	Averaging Period
Carbon Monoxide (CO)	575 $\mu g/m^3$	8-hour
Nitrogen Dioxide (NO_2)	14 $\mu g/m^3$	24-hour
Total Suspended Particulate (TSP)	10 $\mu g/m^3$	24-hour
PM-10	10 $\mu g/m^3$	24-hour
Sulfur Dioxide (SO_2)	13 $\mu g/m^3$	24-hour
Volatile Organic Compounds (VOC)	An increase in actual and potential emissions less than 100 tons per year.	NA
Lead (Pb)	0.1 $\mu g/m^3$	quarterly
Fluorides	0.25 $\mu g/m^3$	24-hour
Total Reduced Sulfur	10 $\mu g/m^3$	1-hour
Hydrogen Sulfide (H_2S)	0.2 $\mu g/m^3$	1-hour
Reduced Sulfur	10 $\mu g/m^3$	1-hour

[a] As specified in 18 AAC 50.310(e).

Item 2 above requires preliminary dispersion modeling. This means that the project-specific details (e.g., equipment types and equipment operation) related to the new source or modification must be well-defined far in advance of beginning construction. If you change your source design before permit issuance, you may need a new modeling analysis to show that you still qualify for the monitoring exemption. If you cannot show you still qualify, the requirement for ambient air data may delay your project.

On-site meteorological monitoring may be required, even when on-site air quality monitoring is not. This depends on whether other suitable data is available.

6.6.3 EPA-Approved Dispersion Models

The demonstration of compliance with the AAAQS and the PSD Increment is typically accomplished through the use of EPA-approved dispersion models that simulate the dispersion of air pollutants from specific air emission units. The results from an EPA-approved dispersion model are given in terms of pollutant concentrations at user-defined locations known as "receptors."

Using dispersion models is a specialized skill beyond the scope of this document to describe. In short though, source-specific data and meteorological data are entered into the model to predict air pollutant concentrations for defined averaging times at each receptor.

In most cases, an EPA-approved model must be used to demonstrate compliance with the AAAQS and PSD Increments. Not all dispersion models are appropriate for all applications. The department recommends that you consult the department prior to choosing a dispersion model. The appropriate model is usually defined in your modeling protocol (discussed in Section 6.6.4). Currently, most projects use the ISC3 model. However, ISC3 will most likely be replaced soon by a new model called AERMOD. Sources of information to find the EPA-preferred/recommended dispersion models are listed below:

- EPA's *Guideline on Air Quality Models* (40 C.F.R. 51, Appendix W);
- EPA's on-line Support Center for Regulatory Air Models (SCRAM) http://www.epa.gov/scram001/; and
- The department's website: http://www.state.ak.us/local/akpages/ENV.CONSERV/dawq/aqm/modeling.htm

SCRAM includes complete lists of approved models. It also offers free versions of the models to the public. The SCRAM website is a good source for keeping track of new dispersion models and changes to the existing models.

Case-by-case approval may be made for the use of other models when the approved models are not optimum or not appropriate to the scenario modeled. However, if case-by-case approval is needed, additional time will be needed for the department and EPA approval process. Additionally, if a model that is not identified in EPA's *Guideline on Air Quality Models* (40 C.F.R. 51, Appendix W) is used, then the public notice for the permit must specifically state that the model used is not included in EPA's *Guideline on Air Quality Models* and specifically request public comment on this aspect of the permit decision.

6.6.4 Modeling Protocol

If an AQIA is required, the department strongly encourages you to submit a modeling protocol to us before you apply for a permit. A modeling protocol outlines the approach that will be used to model the emissions from the stationary source. A modeling protocol is not required by regulation but there is much to be gained by reaching consensus with the department before committing time and resources to a particular modeling approach.

A modeling protocol is not a complete AQIA. A modeling protocol should identify the proposed air dispersion model that will be used to estimate the ambient concentration of emissions from the stationary source or modification. The modeling protocol should also include a list of all the elements necessary to run the proposed air dispersion model. Listed below are the primary elements that would typically be included in a modeling protocol:

- A brief description of the project and the project emission units;
- The existing source and project classifications, as applicable, and the associated regulatory modeling requirements, if any;
- A discussion of what pollutants and averaging times will be modeled;
- A list of all relevant AAAQS and PSD Increments (including baseline dates);
- A discussion of the proposed modeling approach (e.g., if a tiered approach is proposed, describe each tier);
- The proposed air dispersion model that will be used to demonstrate compliance;
- A description of the meteorological data (including data years and data source) and how the data will be processed for the modeling analysis;
- A list of proposed background concentrations (including data source);
- A discussion of the modeling assumptions, including how the emission sources would be characterized;
- A discussion of preliminary assessments, such as load assessments, estimating downwash parameters, etc;

- A discussion of any post-processing efforts, including the use of spreadsheets, specialized programs, and assumptions regarding the conversion of NO to NO_2;
- A description of the proposed receptor grid;
- A description of the proposed ambient air boundary;
- A description of any off-site sources that will be modeled;
- If the project is PSD, a description of the data that will be used to assess the existing ambient air quality, including whether pre-construction monitoring will be done; and
- If the project is PSD, a discussion of any Air Quality Related Values (AQRV) that will be analyzed. AQRV is discussed in detail in Section 9.

6.7 In-Use Limits

The department can impose in-use limits, such as fuel consumption, fuel quality and operating restrictions, on any activity including *nonroad engines* (see Section 2.1 for more information on *nonroad engines*) if necessary to comply with ambient air quality standards. If, as part of the modeling demonstration (described in this section), you propose restrictions on the operation of stationary or mobile sources, these restrictions could be incorporated into the permit as permit limitations. Examples of such restrictions include:

- Limiting the amount of fuel that can be burned in *nonroad engines* as part of a project;
- Limiting equipment hours of operation;
- Limiting the sulfur content of fuel used in *fuel burning equipment* or *nonroad engines* supporting a project; and
- Limiting the number or size of construction equipment that can operate concurrently.

6.8 References

Alaska Department of Environmental Conservation. Ambient Modeling Procedures.

U.S. Environmental Protection Agency. 1995. Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations). EPA-450/4-80-023R. June.

U.S. Environmental Protection Agency. Guideline on Air Quality Models (40 C.F.R. 51, Appendix W).

U.S. Environmental Protection Agency. Support Center for Regulatory Air Models website: http://www.epa.gov/ttn/scram001/ .

7.0 18 AAC 305 REQUESTS

In your air quality control construction permit application, under 18 AAC 305 you may request department approval of the following items:

- Owner requested limits to avoid classification;
- Permit revisions and revocations;
- Nonattainment offset emissions; and
- Stack injection.

These items and their corresponding permit application requirements are discussed in the sections below.

7.1 Owner Requested Limits to Avoid Classification – Application Form H

You may request a limitation that allows your project to avoid classification under one or more of the source classifications described in Section 1.2 or under one or more of the modification classifications described in Section 1.3. To make such a request, your construction permit application must:

- Identify the classification you intend to avoid; and
- Describe the physical or operational limitations you are requesting and how those limitations affect emissions. Your description should include:
  - any calculations or other information necessary to show the effect on emission rates;
  - a proposed permit term or condition describing the physical or operational limitation; and
  - proposed permit terms or conditions describing the monitoring and record keeping strategies you will use to demonstrate that you will continuously comply with the proposed physical or operational limitation.

7.2 Permit Revisions and Revocations – Application Form I

If you are subject to existing source or emission unit-specific permit conditions, you can request to revise or rescind those conditions through a new air quality control construction permit. The existing conditions must have been established in a previous construction permit, in a permit established under the former 18 AAC 50.400, or in an operating permit as a result of an investigation under 18 AAC 50.201. To do this, you must include the following information in your permit application:

- A copy of the air quality control permit that established the permit term or condition;
- An explanation of why the permit term or condition should be revised or revoked;
- The effect of revising or revoking the permit term or condition on emissions, other permit terms, and compliance monitoring; and
- If any of the revisions or revocations of the terms or conditions result in a change to the construction permit classification, all additional information required of an application for the new classification.

You must include in the explanation, any information that is necessary to show that you will comply with all requirements of AS 46.14 and 18 AAC 50 after the change is made to your permit. For example, if the existing condition is a BACT limit, include a demonstration showing that the proposed new limit represents BACT. (See Section 8 of this Guidance Document.) If the existing condition is for protection of ambient air quality, include all information necessary to show that the new limit will protect ambient air quality standards and applicable PSD increments.

7.3 Nonattainment Offset Emissions – Application Form N

You may request physical or operational limitations designed to provide actual emission reductions from an existing stationary source to offset an increase in allowable nonattainment air contaminant emissions from a Nonattainment Major Source [classified in 18 AAC 50.300(d)] or a Nonattainment Major Modification [classified in 18 AAC 50.300(h)(5)-(h)(8)]. To do this, you must include the following information in your air quality control construction permit application:

- The physical or operational limitations necessary to provide actual emission reductions of the nonattainment air contaminant. To accomplish this, you will need to propose a permit term or condition to limit actual emissions. You will also need to propose permit terms or conditions describing the monitoring and record keeping strategies you will use to demonstrate compliance with the limitation on actual emissions;
- A calculation of the expected reduction in actual emissions. See Section 2.0 to understand how to calculate emissions; and
- The emission limitation representing that quantity of emission reduction.

Additionally, you will need to certify that the proposed reductions in actual emissions will occur before the onset of emission increases due to construction, operation, or modification of the new or modified source.

7.4 Stack Injection – Application Form P

You may request the emission of an air contaminant other than process emissions, products of combustion, or materials introduced to control air contaminant emissions from a stack at a stationary source built or modified after November 1, 1982. To do this, you must include the following information in your air quality control construction permit application for each stack for which you are making this request [18 AAC 310(m)]:

- An engineering analysis that shows the combined exhaust can meet the emission standards and opacity limitations of 18 AAC 50;
- For hazardous air contaminants, an estimate of the maximum ambient concentration resulting from the stack;
- For the material that you are proposing to introduce into the stack the following information:
  - The stack conditions necessary to ensure complete combustion of the material;
  - A description of other environmentally sound procedures available to treat or dispose of the material, if any; and
  - The effect of the material on the efficiency or useful life of any pollution control equipment;

- A laboratory analysis describing the amount and content of material that you proposes to introduce into the stack; and
- A discussion of the operating parameters showing how you will control the rate at which the material is introduced into the stack.

The department recommends that you contact them before preparing an air quality control construction permit application for stack injection.

The department can issue the permit only if the application shows that

- The material introduced into the stack will be completely incinerated;
- The resulting emissions will not cause the downwind concentration of a hazardous air contaminant to be injurious to human health or welfare;
- No other environmentally sound procedure is reasonably available to treat or dispose of the material; and
- The material will not significantly degrade or erode pollution control equipment.

The department must include in any permit allowing such stack injection any terms necessary to ensure the permittee will build and operate the emission unit consistent with the preceding paragraph. This would include monitoring, record keeping, and reporting.

8.0 CASE-BY-CASE TECHNOLOGY EVALUATIONS – FOR MAJOR SOURCES AND MODIFICATIONS – PSD, NONATTAINMENT, AND HAP

PSD and the nonattainment permitting programs require case-by-case emission limits based on control technology. Permits for hazardous air pollutant major projects may also require case-by-case limits. This section describes the following air pollutant control technology requirements:

- Best Available Control Technology (BACT);
- Lowest Achievable Emission Rate (LAER): and
- Case-by-Case Maximum Achievable Control Technology (MACT).

8.1 Best Available Control Technology (BACT) – Application Form F

8.1.1 What is BACT?

BACT is defined as:

> *"The emission limitation that represents the maximum reduction achievable for each regulated air contaminant, taking into account energy, environmental and economic impacts, and other costs; the resulting emissions must comply with applicable state and federal emission standards; best available control technology includes, for example, design features, equipment specifications, and work practices."* [18 AAC 50.990(13)]

As defined above, BACT is an emission limit. A BACT emission limit cannot be less stringent than an NSPS standard. See Section 5.1 for NSPS standards.

Several strategies may be used to achieve the BACT emission limit as described below:

- **Add-on controls:** Add-on controls consist of equipment added to the exhaust of an emission unit to reduce the emissions of a particular pollutant. Examples of add-on controls are:
  - Catalytic oxidation for destruction of emissions of carbon monoxide (CO);
  - Selective catalytic reduction for removal of emissions of oxides of nitrogen (NO_X);

  - Wet scrubber for removal of particulate matter from an exhaust stream;
  - Chemical scrubbing to remove emissions of oxides of sulfur (SO_x); and
  - Afterburner for destruction of emissions of volatile organic compounds (VOC).

- **Design features:** Manufacturers incorporate features into equipment in an effort to reduce emissions. Examples of design features are listed below:
  - Low NO_X burners on boilers and heaters to reduce production of NO_X; and
  - Incorporation of advanced engine management controls on internal combustion (I.C.) engines to minimize emissions of NO_X;

- **Equipment specifications:** When purchasing equipment, it is sometimes possible to purchase equivalent units with different emissions characteristics. A cleaner running unit could be a BACT candidate.

- **Work practices:** On occasion, work practices also serve to reduce emissions and therefore could be considered a BACT candidate. One example of such a work practice is the regular monitoring and repair of piping components such as valves and flanges in order to minimize emissions of a VOC product in the piping.

8.1.2 Who is Required to Perform BACT?

If your project is classified as a PSD Major Source or a PSD Major Modification (M3, M4a, or M4b), you are required to do a BACT analysis. As the first step of the permit application process, you should have identified your project classification. (See Sections 1.2 and 1.3) If your project is PSD Major, you must perform a BACT analysis for each *regulated air pollutant* with an increase in *actual emissions* of at least the amounts shown in Table 8-1. (See Section 2.3 for calculating an increase in *actual emissions*.) For example, if changes to your PSD Major Source will result in an *actual emission* increase of 150 tons per year (TPY) of CO, 100 TPY of NO_X, 10 TPY of SO_2, 15 TPY of PM-10, and 30 TPY of VOC, then you are required to perform a BACT analysis for emissions of CO and NO_X because these air pollutants exceed the thresholds in Table 8-1.

Table 8-1

PSD MAJOR SOURCES – INCREASE IN ACTUAL EMISSIONS[a]

Air Pollutant	Actual Emissions of At Least (TPY[b])
CO	100
NO_X	40
SO_2	40
Total Particulate Matter	25
PM-10	15
VOCs (as on ozone indicator)	40
Lead	0.6
Fluorides	3
Sulfuric Acid Mist	7
Total Reduced Sulfur Compounds, including H_2S	10
Hydrogen Sulfide (H_2S)	10
Reduced Sulfur Compounds, including H_2S	10
Municipal Waste Combustor Organics, measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans	0.0000035
Municipal Waste Combustor Metals, measured as particulate matter	15
Municipal Waste Combustor Acid Gases, measured as sulfur dioxide and hydrogen chloride combined	40
Municipal Solid Waste Landfill Emissions measured as nonmethane organic compounds	45 megagrams per year (50 TPY)
Any *regulated air pollutant* not listed above, except for hazardous air pollutants, organic vapors, and ammonia[c]	Any Increase
If located within 10 kilometers of a Class I area, any *regulated air pollutant* (including those listed above).	Any increase that would result in an ambient concentration of that pollutant greater than one microgram per cubic meter (24-hour average) in the Class I area.

a From 18 AAC 50.310(d) and 18 AAC 50.300(h)(3)
b TPY = tons per year
c Essentially this is limited to ozone depleting substances. Ozone depleting substances are specified in Clean Air Act, Section 6.02.

A BACT analysis is equipment-specific and air pollutant-specific. For each *regulated air pollutant* for which you are required to perform a BACT analysis, you must perform the analysis for each stationary emission unit that that is part of the project and emits the pollutant. For a new source the BACT analysis must be done for every emission unit that emits the pollutant. For example, if a BACT analysis for CO emissions is required at a new stationary source that has I.C. engines, boilers, turbines, and fuel storage tanks, a separate BACT analysis is required for the I.C. engines, boilers, and turbines. Because CO emissions are not expected from fuel storage tanks, a BACT analysis is not required for the fuel storage tanks.

For a major modification to an existing source, you must perform a BACT analysis only for the emission units that are affected by the modification and that emit the pollutant exceeding the threshold. For example, if you have an existing source that has I.C. engines, boilers, turbines, and fuel storage tanks and you propose to install two new boilers and one new turbine, which will result in an increase in NO_X emissions of 50 TPY, you are required to perform a BACT analysis for NO_X emissions from the new boilers and the new turbine only. You do not need to perform a BACT analysis for the existing emission units since they are not affected by the modification.

Nonroad engines are not subject to BACT requirements. (See Section 2.1 for the definition of *nonroad engine*.)

8.1.3 Schedule for Conducting BACT Analysis

To conduct a BACT analysis, you must consider all available control options. Since control options can include design features and equipment specifications, it is important that you conduct the BACT analysis in parallel with the equipment selection process. Doing this will ensure that the equipment selection process takes advantage of the information collected regarding emission reduction potential of different options.

The BACT decision is made at the time of permit issuance. An incomplete BACT analysis will delay permit issuance if additional work is required to address options that were not evaluated in the analysis. If the equipment selected is not consistent with the findings of an objective BACT analysis, it will need to be changed to comply with the final BACT determination.

8.1.4 Overview of Performing a BACT Analysis

BACT analyses are considered on a case-by-case basis. Each analysis is conducted considering issues such as costs that are specific to the equipment being evaluated. Prior BACT determinations, whether at other stationary sources or conducted by other agencies, can be cited as precedents. Precedents usually serve to establish a minimum performance expectation (i.e., your BACT selection must be at least as effective as earlier determinations for similar equipment).

BACT analyses are conducted for a specific equipment unit and for a particular pollutant.

A BACT analysis must follow the approach recommended by the U. S. Environmental Protection Agency (EPA) in the 1990 draft New Source Review (NSR) Workshop Manual. The EPA approach is often referred to as the "top-down" BACT analysis. The EPA NSR Workshop Manual describes the top-down BACT analysis procedures in detail. The five steps of a typical top-down BACT process are:

1. Identify the available and demonstrated technologies for the air pollutants and sources;
2. Eliminate technically infeasible control alternatives;
3. Rank remaining control technologies by control effectiveness;
4. Evaluate the most effective controls and document results. This step involves evaluating the associated economic, energy, and environmental impacts, beginning with the most effective control technology. If the control technology is eliminated for economic, energy, or environmental reasons, repeat the evaluation for each successive technology; and
5. Summarize BACT selections.

A brief description of each step is presented below.

Step 1: Identify All Control Technologies

The first step in a top-down BACT analysis is to identify all available control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emission unit and *regulated air pollutant* under evaluation. Air pollution controls include technologies, methods, systems, and techniques for control of the *regulated air pollutant*, as well as alternate production processes that may reduce the generation of air pollutants. The control alternatives should not only include existing controls for the source category or piece of equipment in question, but also controls applied to similar source categories. Control options in use outside of United States should be considered. Technologies required under LAER determinations must also be included as control alternatives for BACT purposes. Section 8.2 describes LAER in detail.

In the course of the BACT analysis, one or more of the options may be eliminated from consideration if demonstrated to be technically infeasible or have unacceptable energy, economic, or environmental impacts on a case-by-case (or site-specific) basis. However, initially, all control options with potential application to the emissions unit under review should be identified.

Potentially applicable control alternatives can be categorized in three ways:

- **Inherently Lower-Emitting Processes/Practices**, which include the use of materials and production processes and work practices that prevent emissions and result in lower "production-specific" emissions;
- **Add-on Controls**, which control and reduce emissions after they are produced, such as catalysts, scrubbers, or electrostatic precipitators; and
- **Combinations of Inherently Lower-Emitting Processes/Practices and Add-on Controls**, for example, the application of combustion and post-combustion controls to reduce NO_X emissions from a gas-fired turbine.

In the top-down BACT analysis, potentially applicable control techniques from all three categories should be considered. Lower-polluting processes should be considered based on demonstrations that it is possible to manufacture identical or similar products from identical or similar raw materials or fuels. Add-on controls, on the other hand, should be considered based on the physical and chemical characteristics of the air pollutant-bearing emission stream. Thus, candidate add-on controls may have been applied to a broad range of emission unit types that have similar emissions characteristics to the emissions unit undergoing BACT review.

Technology transfer must also be evaluated. Technology transfer concerns the application of a control technology to source categories other than, but with similar emission characteristics to, the source under consideration.

Although not required, innovative technologies may also be evaluated and proposed as BACT. To be considered innovative, a control technique must meet the provisions of 40 Code of Federal Regulations (C.F.R) 52.21(b)(19).

To be considered an applicable technology, the technology must be successfully demonstrated in practice on full-scale operations. Technologies which have not yet been applied to (or permitted for) full-scale operations need not be considered available. You should be able to purchase or construct a process or control device that has already been demonstrated in practice.

Information sources to consider when identifying the available control technologies include the following:

- **EPA's RBLC Database**: This database lists technologies that have been implemented as Reasonably Available Control Technology (RACT), BACT, or LAER and is known as the RACT/BACT/LAER Clearinghouse or RBLC database. The RBLC database is maintained by the EPA's Clean Air Technology Center (CATC), which serves as a repository of Federal, state, and local agency control technology determinations. The RBLC database can be searched using various criteria such as equipment type or pollutant type. The RBLC database is available on EPA's website at http://cfpub.epa.gov/rblc/htm/bl02.cfm. It should be noted that this address may change; however, the RBLC database can most likely be found on EPA's website under the Technology Transfer Network, Clean Air Technology Center.
- **Control Technology Vendors and Environmental Consultants**: Air pollution control vendors and consultants can be contacted to determine whether the air pollution control equipment they offer is applicable to the emission source and air pollutant being evaluated.
- **Federal/State/Local NSR Permits**: Recent NSR permits (i.e., PSD permits or Nonattainment Major permits) issued by Federal, state, and local agencies may provide useful information about available control technologies. Copies of final permits can usually be obtained by contacting a particular agency and requesting a copy. Some agencies may even post final permits on their websites. The department's permit page can be found at the following web address:

http://www.state.ak.us/local/akpages/ENV.CONSERV/dawq/aqm/newpermit.htm

- **Other Information Sources**: Other information sources to consider are listed on page B.11 of EPA's NSR Workshop Manual.

Step 2: Eliminate Technically Infeasible Options

In the second step of the top-down BACT analysis, the technical feasibility of the control options identified in Step 1 is evaluated with respect to source-specific factors. The list of technically infeasible control options must be clearly documented. You must demonstrate that, based on physical, chemical, and/or engineering principles, technical difficulties will preclude the successful use of the control option. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

Determining technical feasibility should be straightforward for control technologies that are demonstrated; if the control technology has been installed and operated successfully on the type of source under review, it is demonstrated and technically feasible. For control technologies that are not demonstrated in the same sense indicated above, the analysis is somewhat more involved.

Two concepts are important in determining whether an undemonstrated technology is feasible: "availability" and "applicability." A technology is considered "available" if it can be obtained through commercial channels or is otherwise available in the common understanding of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is considered technically feasible.

A demonstration of technical infeasibility is based on a technical assessment considering physical, chemical, and engineering principles, and/or empirical data showing that the technology would not work on the emissions unit under review, or that unresolvable technical difficulties would preclude the successful deployment of the technique. If the resolution of technical difficulties is a matter of cost, the technology should be considered technically feasible. The economic feasibility of a control technology is reviewed in the economic impacts portion of the BACT selection process.

Important points to remember in assessing technical feasibility of control alternatives include:

- A control technology that is "demonstrated" for a given type or class of sources is assumed to be technically feasible unless source-specific factors exist and are documented to justify technical infeasibility;
- Technical feasibility of technology transfer control candidates generally is assessed based on an evaluation of pollutant-bearing gas stream characteristics for the proposed source and other source types to which the control has been applied previously;
- Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis; and
- The applicant is responsible for providing a basis for assessing technical feasibility or infeasibility and the department is responsible for the decision on what is and is not technically feasible.

Step 3: Rank Remaining Control Technologies

In Step 3, all remaining control alternatives not eliminated in Step 2 are ranked in order of control effectiveness for the air pollutants under review. The most effective control alternative is ranked at the top. A list of control alternatives is prepared for each air pollutant and for each emission unit subject to the BACT analysis.

Manufacturer's data, engineering estimates, and the experience of other sources provide the basis for determining achievable emission levels. Consequently, in assessing the capability of a control alternative, latitude exists to consider any special circumstances pertinent to the specific source under review, or regarding the prior application of the control alternative. However, the basis for ranking and choosing the alternative level (or range) of control in the BACT analysis must be documented. When reviewing a control technology with a wide range of emission performance levels, it is presumed that the source can achieve the same emission reduction level as another source unless the applicant demonstrates that source-specific factors or other relevant information provide a technical, economic, energy, or environmental justification to do otherwise. Also, a control technology that has been eliminated because it would have an adverse economic impact at its highest level of performance may be acceptable at a lesser level of performance.

After determining the emissions performance levels (in common units, e.g. parts per million [ppm], pounds per hour [lbs/hr]) of each control technology option identified in Step 2, a hierarchy is established that places at the "top" the control technology option that achieves the lowest emissions level (i.e., the highest control efficiency). Each remaining control option is then placed after the top option in the hierarchy according to its respective emissions performance level, ranked from the lowest emissions to highest emissions (most effective to least effective emissions control alternative). The example below demonstrates how to rank control technologies based on emission performance levels.

Scenario: You are evaluating NO_X control technologies for a heater that has uncontrolled NO_X emissions of 10 lbs/hr. The following control technologies and emission performance levels have been identified:

- Control Technology A will reduce NO_X emissions to an emission level of 3 lbs/hr (equivalent to a 70 percent control efficiency);
- Control Technology B will reduce NO_X emissions to an emission level of 1 lb/hr (equivalent to a 90 percent control efficiency); and
- Control Technology C will reduce NO_X emissions to an emission level of 2 lbs/hr (equivalent to an 80 percent control efficiency).

Control Technology Rankings: Based on the above information, ranking the control technologies by placing the control technology that achieves the lowest emission level (i.e., the highest control efficiency) at the "top" would result in the following:

1. Control Technology B (90 percent efficiency);
2. Control Technology C (80 percent efficiency); and
3. Control Technology A (70 percent efficiency).

If technologies can be combined, such as a low emitting unit with add on controls, the combined application of control technologies will represent a more stringent level of control and should be listed accordingly.

For each emission unit and control option, prepare a chart identifying the control hierarchy and:

- Expected emission rate (tons per year, pounds per hour);
- Control efficiency;
- Emission reduction amount;

- Economic impacts (total annualized costs, cost effectiveness, incremental cost effectiveness);
- Environmental impacts (includes any significant or unusual other media impacts [e.g., water or solid waste], and the relative ability of each control alternative to control emissions of toxic or hazardous air pollutants); and
- Energy impacts (indicate any significant energy benefits or disadvantages).

The chart is used in comparing the control alternatives during step 4 of the BACT selection process.

The department recommends that you contact the department at this point to ensure that you have indeed identified all of the available control options.

Step 4: Evaluate Most Effective Control Technology

After the available and technically feasible control technology options have been identified, potential energy, environmental, and economic impacts must be considered to determine the best available level of control. For each control option, the applicant must present an objective evaluation of each impact. Both beneficial and adverse impacts should be described and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative.

In this step, the technology with the highest control efficiency is evaluated first. If this technology is found to have no significant adverse environmental, energy, or economic impacts, it is selected as BACT and no further analysis is necessary. If the most stringent technology is shown to be inappropriate because of energy, environmental, or economic reasons, the applicant must fully document why the top alternative is inappropriate. Then, the next most effective control alternative on the list becomes the new control candidate and is similarly evaluated. This process continues until the technology under consideration cannot be eliminated due to source-specific rationale.

The paragraphs below provide an overview of how to assess energy, environmental, and economic impacts.

Energy Impact Analysis

To analyze potential energy impacts, the energy requirements of the control technology should be evaluated, and any significant or unusual energy penalties or benefits should be identified. If such penalties or benefits exist, they should be quantified. Because energy penalties or benefits can usually be quantified in terms of additional economic cost or income to the source, the energy impacts analysis can, in most cases, simply be factored into the economic impacts analysis. In general, energy penalties are not considered adequate justification for nonuse of the technology. Energy impacts should consider only **direct** energy consumption and not **indirect** energy impacts (such as energy to produce raw materials for construction of control equipment).

An example of an adverse energy impact is when an oxidation catalyst is installed on a gas turbine. The application of oxidation catalyst technology to a gas turbine will result in an increase in backpressure on the turbine due to pressure drop across the catalyst bed. The increased backpressure will, in turn, reduce turbine output power, and in turn reduce fuel efficiency. A turbine installed with a catalyst will require additional fuel to be burned to achieve the same output power as a turbine without a catalyst. The cost for the additional fuel that will be burned to overcome the reduction in turbine output power caused by the catalyst can be included in a cost-effectiveness analysis, which is described in the Economic Impact Analysis section below.

Environmental Impact Analysis

The purpose of an the environmental impact analysis is to identify impacts on the environment, other than direct impacts on air quality due to emissions of the *regulated air pollutant* under review. Examples of such environmental impacts include solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts, and emissions of unregulated or other *regulated air pollutants.*

The applicant should identify any significant or unusual environmental impacts associated with a control alternative that have the potential to affect the selection or elimination of a control alternative. Some control technologies may have potentially significant secondary (i.e., collateral) environmental impacts. Scrubber effluent, for example, may affect water quality and land use. Emissions of water vapor from technologies using cooling towers may affect local visibility. Secondary environmental impacts could include hazardous waste discharges, such as spent catalysts or contaminated carbon. Generally, these types of environmental concerns become important when sensitive site-specific receptors exist or when the incremental emissions reduction potential of the top control is only marginally greater than the next most effective option. However, the fact that a control device creates liquid and solid waste that must be disposed of does not necessarily argue against selection of that technology as BACT, particularly if the control device has been applied to similar facilities elsewhere and the solid or liquid waste problem under review is similar to those other applications. On the other hand, where the applicant can show that unusual circumstances at the proposed project create greater problems than experienced elsewhere, this may provide a basis for the elimination of that control alternative as BACT.

The procedure for conducting an analysis of environmental impacts should be made based on consideration of site-specific circumstances. In general, however, the analysis of environmental impacts starts with the identification and quantification of the solid, liquid, and gaseous discharges from the control device or devices under review. This analysis of environmental impacts should be performed for the entire hierarchy of technologies (even if the applicant proposes to adopt the "top", or most stringent, alternative). However, the analysis need only address those control alternatives with any significant or unusual environmental impacts that have the potential to affect the selection or elimination of a control alternative. Thus, the relative environmental impacts (both positive and negative) of the various alternatives can be compared with each other and the "top" alternative.

Initially, a qualitative or semi-qualitative screening is performed to narrow the analysis to discharges with potential for causing adverse environmental effects. Next, the mass and composition of any such discharges should be assessed and quantified to the extent possible, based on readily available information. Pertinent information about the public or environmental consequences of releasing these materials should also be assembled.

Some possible factors to consider when evaluating the potential for an adverse environmental impact are listed below:

- **Water Impacts:** Relative quantities of water used and water pollutants produced and discharged as a result of use of each alternative emission control system relative to the "top" alternative should be identified. Where possible, the analysis should assess the effect on ground water and local surface water quality parameters such as pH, turbidity, dissolved oxygen, salinity, toxic chemical levels, temperature, and any other important considerations. The analysis should consider whether applicable water quality standards will be met and the availability and effectiveness of various techniques to reduce potential adverse effects.

- **Solid Waste Disposal Impact:** The quality and quantity of solid waste (e.g., sludges, solids) that must be stored and disposed of or recycled as the result of the application of each alternative emission control system would be compared with the quality and quantity of wastes created with the "top" emission control system. The composition and various other characteristics of the solid waste (such as permeability, water retention, rewatering of dried material, compression strength, leachability of dissolved ions, bulk density, ability to support vegetation growth, and hazardous characteristics) which are significant with regard to potential surface water pollution or transport into and contamination of subsurface waters or aquifers would be appropriate for consideration.
- **Irreversible or Irretrievable Commitment of Resources:** The BACT decision may consider the extent to which the alternative emission control systems may involve a trade-off between short-term environmental gains at the expense of long-term environmental losses and the extent to which the alternative systems may result in irreversible or irretrievable commitment of resources (e.g., use of scarce water resources).
- **Other Environmental Impacts:** Significant difference in noise levels, radiant heat, or dissipated static electrical energy, or greenhouse gas emissions may be considered. Additionally, the trade-off between emissions being controlled by the control technology and those (if any) being produced by the control technology should be evaluated. For example, the use of certain VOC control technologies can increase NO_X emissions.

  If the emission control system is also an emission source of another air pollutant in PSD significant amounts, then the emission control system will require BACT. Examples of such possible cases are waste gas incinerators or flaring systems.

- **Emissions of Toxic and Hazardous Air Pollutants:** The generation or reduction of toxic and hazardous air pollutants, including those not regulated under the CAA, should be considered as part of the environmental impact analysis.

Economic Impact Analysis

Once the control technology alternatives and achievable emissions performance levels have been identified, capital and annual costs should be developed. These costs form the basis of the cost and economic impacts used to determine and document whether a given control alternative should be eliminated on the grounds of its economic impact. Cost effectiveness is the economic criterion used to assess the potential for achieving an objective at least cost. Effectiveness is measured in terms of tons of air pollutant emissions removed, and cost is measured in terms of annualized control costs.

In the economical impacts analysis, primary consideration should be given to quantifying the cost of control and not the economic situation of the individual source. Consequently, applicants generally should not propose elimination of control alternatives on the basis of economic parameters that provide an indication of the affordability of a control alternative relative to the source. BACT is required by law. Its costs are integral to the overall cost of doing business and are not to be considered an afterthought. Consequently, for control alternatives that have been effectively employed in the same source category, the economic impact of such alternatives on the particular source under review should be not nearly as pertinent to the BACT decision making process as the average and, where appropriate, incremental cost effectiveness of the control alternative. Thus, where a control technology has been successfully applied to similar sources in a source category, an applicant should concentrate on documenting significant cost differences, if any, between the application of the control technology on those other sources and the particular source under review.

Average cost effectiveness (total annualized costs of control divided by annual emissions reductions) is a way to present costs of control. Average cost effectiveness is calculated as shown by the following formula:

$$\text{Average Cost Effectiveness (dollars per ton removed)} = \frac{\text{Control option annualized cost}}{\text{Emissions reduction (tons of air pollutant removed)}}$$

Costs are calculated in (annualized) dollars per year ($/yr) and emissions rates are calculated in tons per year (tons/yr). The result is a cost effectiveness number in (annualized) dollars per ton ($/ton) of air pollutant removed.

If the cost of reducing emissions with the top control alternative, expressed in dollars per ton, is on the same order as the cost previously borne by other sources of the same type applying that control alternative, the alternative should initially be considered economically achievable and therefore acceptable as BACT. However, unusual circumstances may greatly affect the cost of controls in a specific application. Consequently, where unusual factors exist that result in cost/economic impacts beyond the range normally incurred by other sources in that category, the technology can be eliminated provided the unusual circumstances have adequately been identified, and clearly documented.

The department recommends that applicants use EPA's *Air Pollution Control Cost Manual*, Sixth Edition, EPA-452-02-001, January 2002, referred to in the remainder of this section as the "Manual," for preparing a cost-effectiveness evaluation. Any deviations from the procedures in the Manual should be clearly presented and justified. The Manual provides comprehensive procedures and data for developing cost estimates. It provides information on air pollution controls for particulate matter (PM), NO_X, VOCs, and some acid gases (primarily SO_2 and hydrogen chloride [HCl]). The Manual contains numerous chapters that address specific control technologies for specific air pollutants. Each chapter contains a:

- **Process description**, in which the types, uses, and operating modes of the control technology and (if applicable) its auxiliaries are discussed;
- **Sizing (design) procedure**, which enables one to use the parameters of the pollution source (e.g., gas volumetric flow rate) to size the equipment item(s) in question;
- **Capital and annual costing procedure and data** for the equipment and suggested factors to use in estimating these costs from equipment design and operational (e.g., operational hours) parameters. These costs are presented in both graphical and equation forms whenever possible.
- **Example problems** to illustrate the sizing and costing procedures presented in the chapter.

To determine the cost-effectiveness of a control technology, it is necessary to estimate both capital and annual costs. Section 1, Chapter 2 of the Manual provides an overview of the cost estimation concepts and methodology used in the Manual.

Total capital costs, or the total capital investment, include all costs required to purchase equipment needed for the control system (purchased equipment costs), the costs of labor and