Air Permitting – Lesson 2 – Engineering in Permit Applications

Course Content

Prepare Outlines

Organizing the steps for completing the air permit application provides guidance throughout the air permit application process. Several types of outlines, as listed below, are essential to keep the application preparation process organized, particularly if some portions are delegated to other staff for implementation.

AIR PERMIT APPLICATION OUTLINE

Requirements for an air permit application depend upon the type of permit application planned. The typical major permits include new source review (NSR) also known as prevention of significant deterioration (PSD) permits, and Title V operating permits. The next level of permitting is represented by state air construction or "permit-to-install" permits, and the least restrictive permits are minor, general, and synthetic minor permits.

Outlines for each type of permit application are represented by the examples accessible on the Internet as listed in the related links portion of this course.

APPENDICES OUTLINE

Planning for the appendices is a valuable tool for organizing the supporting documents and drawings. One method to facilitate keeping track of all the information is to label the information electronically within file names labeled "Appendix A", "Appendix B", etc. Then when it is time to consolidate all the information within an appendix, the files may be sorted at that time to follow the same order as the citations in the air permit application. Another method for tracking appendices is to label hard copies of pertinent information with the appropriate appendix heading for sorting by hand maintaining the same order as the permit application text citations.

CHECKLIST OUTLINE

State and federal regulators develop checklists to compare the air permit application to the regulatory requirements. This type of list includes all of the information that is necessary for the regulatory agency to process the final permit. Many times, but not always, writing the permit application in the same order and organization of the checklist may expedite processing because all of the terms, formats, and supporting information is in the order that regulators use for their analysis. There are two activities that the federal or state government must complete before starting a review of the air permit

application. The first is collecting a fee, if required, for processing the air permit application. The second is meeting the requirements of a "completeness check" based upon comparing the air permit application with the checklist. If the application is deemed incomplete, the review process stops until the critical information is received to resume reviewing the permit application. One way to minimize the impact of having an incomplete air permit application is to fill out and enclose the completeness checklist labeled with the matching reference pages in the final draft of the application. When the regulatory representatives see that part of their task has been incorporated in the air permit application, processing of the final permit is generally facilitated. This completeness review by the permit application author also provides additional verification that all of the essential engineering data and drawings are included in the final submittal. A representative air permit application completeness checklist is shown in Table A below.

Table A – Representative Title V Air Operating Permit
Application Completeness Checklist

OPERATING PERMIT APPLICATION COMPLETENESS CHECKLIST
-1- Utah Operating Permit Application Completeness Checklist Last revised June 29, 2000
TO BE COMPLETED BY REVIEW ENGINEER WITHIN 60 DAYS OF RECEIPT OF THE APPLICATION. CRITERIA
DERIVED FROM R307-415-5, UTAH ADMINISTRATIVE CODE (UAC). ANY NEGATIVE RESPONSE WILL CAUSE
APPLICATION TO BE DEEMED ADMINISTRATIVELY INCOMPLETE IN ACCORDANCE WITH R307-415-5a(2), UAC.
ALL REFERENCES ARE TO THE UAC EXCEPT AS NOTED.
1. Source Identification Information. [R307-415-5c(1)]
Name, address, and telephone number (w/area code) of:
A. Company submitting application. Y Q N Q
B. Plant manager and/or contact. Y Q N Q
C. Plant (if different from Company). Y Q N Q N/A Q
D. Company owner and agent. Y Q N Q
Comments:
2. Description of Source Process. [R307-415-5c(1)]
A. SIC Code(s) Y Q N Q
B. Description of processes involved: (Appendix C) Y Q N Q
C. Description of product(s): (Appendix C) Y Q N Q
Comments:
3. Emissions Related Information. [R307-415-5c(3)]
A. Is there other information available required by any applicable requirement,
such as: [R307-415-5c(3)(9)]
1. Location of emission units (Appendix A) Y Q N Q N/A Q
2. Building dimensions (Appendix A) Y Q N Q N/A Q
3. Stack parameters (height, diameter, plume, temperature, etc. (Appendix A) Y Q N Q N/A Q

4. Flow rates (Appendix B) Y Q N Q N/A Q

B. Is information available on the following, to the extent it is needed, to determine or regulate emissions: [R307-415-5c(3)(d)] (Appendix C)

1. Fuels Y Q N Q N/A Q

2. Fuel use Y Q N Q N/A Q

3. Raw material(s) Y Q N Q N/A Q

4. Production Rates Y Q N Q N/A Q

5. Operational schedule, including daily and seasonal variations, associated with each emission unit.
Y Q N Q N/A Q

C. Does the application describe all potential emissions of air pollutants for which the source is major? [R307-415-5c(3)(a)] (Appendix D)
Y Q N Q

D. Does the application describe all potential emissions for regulated air pollutants? [R307-415-5c(3)(a)] (Appendix D)
Y Q N Q N/A Q

E. Does the application describe all potential emissions for hazardous air pollutants? [R307-415-5c(3)(a)] (Appendix D)
Y Q N Q N/A Q

F. Does the application contain additional information related to the emissions of air pollutants sufficient to verify which requirements are applicable to the source and necessary to collect any permit fees? [R307-415-5c(3)(a)] (Appendix D)
Y Q N Q

G. Does the application identify and describe all emission points in sufficient detail to establish the basis for fees and applicability of applicable requirements? [R307-415-5c(3)(b)] (Appendices A and D)
Y Q N Q

H. Are emission rates listed in units of tons per year and in such terms as are necessary to establish compliance consistent with the applicable standard reference test method? [R307-415-5c(3)(c)] (Appendix D)
Y Q N Q

I. For regulated or hazardous air pollutants, are there any limitations on source operations affecting: [R307-415-5c(3)(f)] (Appendix D)

1. Emissions Y Q N Q N/A Q

2. Any work practice standards Y Q N Q N/A Q

J. Does the application include calculations on which emissions-related information are based? [R307-415-5c(3)(h)] (Appendix D)
Y Q N Q N/A Q

K. Is there a list of insignificant emissions units or activities exempted from complete description because of size or production rate? [R307-415-5c(3)(i)] (Appendix E)
Y Q N Q N/A Q

L. Does the application identify and describe control equipment ?
[R307-415-5c(3)(e)] (Appendix F)
Y Q N Q

Comments:

4. Monitoring Requirements.

A. Does the application identify and describe compliance monitoring devices or activities? [R307-415-5c(3)(e)] (Appendix G)

Y Q N Q

B. Does the application contain a description of, or reference to, any applicable test method for determining compliance with each applicable requirement ? [R307-415-5c(4)(b)] (Appendix G)

Y Q N Q

Comments:

5. Applicable Requirements.

A. Does the application cite and describe all applicable requirements, to include but not limited to: SIP, HAP, NSPS, PSD, & NSR? [R307-415-5c(4)(a)] (Appendix H)

Y Q N Q

B. Is other specific information that may be necessary to implement and enforce applicable requirements or to determine the applicability of such requirements included in the application? [R307-415-5c(5)]

Y Q N Q N/A Q

C. Is there an explanation for any proposed exemptions from otherwise applicable requirements? [R307-415-5c(6)] (Appendix I)

Y Q N Q N/A Q

Comments:

6. Other Information Requirements.

Is all additional information necessary to define the permit terms and conditions for the following included in the application [R307-415-5c(7)]?

A. Alternative operating scenarios [R307-415-6a(9)] Y Q N Q N/A Q

B. Trading of emissions increases and decreases [R307-415-6a(10)] (Appendix J) Y Q N Q N/A Q

Comments:

7. Compliance Plan. (Appendix K)

Does the application include a compliance plan with all of the following:

A. Description of the compliance status of the source with respect to all applicable requirements? [R307-415-5c(8)(a)]

Y Q N Q

B. For applicable requirements with which the source is in compliance, a statement that the source will continue to comply with such requirements? [R307-415-5c(8)(b)(i)]

Y Q N Q N/A Q

C. For applicable requirements that will become effective during the permit term, a statement that the source will meet such requirements on a timely basis? [R307-415-5c(8)(b)(ii)]

Y Q N Q

D. For requirements for which the source is not in compliance at the time of permit application, a narrative description of how the source will achieve compliance with such requirements? [R307-415-5c(8)(b)(iii)]

Y Q N Q N/A Q
Comments:
8. Compliance Schedule. (Appendix K)
Does the application include a compliance schedule which includes the following:
A. For applicable requirements with which the source is in compliance, a statement that the source will continue to comply with such requirements ?
[R307-415-5c(8)(c)(i)]
Y Q N Q N/A Q
B. For applicable requirements that will become effective during the permit term, a statement that the source will meet such requirements on a timely basis?
[R307-415-5c(8)(c)(ii)]
Y Q N Q
C. A schedule of compliance for sources that are not in compliance with all applicable requirements at the time of permit issuance which includes the following: [R307-415-5c(8)(c)(iii)]
1. A schedule of remedial measures? Y Q N Q N/A Q
2. Enforceable sequence of actions with milestones leading to compliance? Y Q N Q N/A Q
3. Resemble and at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject?
Y Q N Q N/A Q
D. Does the application include a schedule for submission of certified progress reports no less frequently than every 6 months for sources required to have a schedule of compliance to remedy a violation? [R307-415-5c(8)(d)]
Y Q N Q N/A Q
E. If the source is an "affected source" under the acid rain portion of the act, are the requirements of the compliance plan included in the acid rain portion of a compliance plan for the source, except as specifically superseded by regulations promulgated under title IV of the Act? [R307-415-5c(8)(e)]
Y Q N Q N/A Q
Comments:
9. Certification of Compliance. (Appendix K)
A. Is there a certification of compliance with all applicable requirements and the truth, accuracy, and completeness of the application based on information and belief formed after reasonable inquiry, signed by a responsible official?
[R307-415-5c(9)(a)] *(This is not the same as the certification of the application! Two certifications are required for the app to be complete.)*
Y Q N Q
B. Does the application include a statement of the methods used for determining compliance, to include the following: [R307-415-5c(9)(b)]
1. description of monitoring? Y Q N Q N/A Q
2. recordkeeping? Y Q N Q N/A Q
3. reporting requirements? Y Q N Q N/A Q
4. test methods? Y Q N Q N/A Q
C. Does the application include a schedule for submission of compliance certifications during the permit term, to be submitted annually, or more

frequently if specified by the underlying applicable requirement or by the Executive Secretary? [R307-415-5c(9)(c)]

Y Q N Q

D. Does the application include a statement indicating the source's compliance status with any applicable enhanced monitoring and compliance certification requirements of the act? [R307-415-5c(9)(d)]

Y Q N Q N/A Q

Comments:

10. Does the application use nationally-standardized forms for acid rain portions of the application and compliance plan? [R307-415-5c(10)]

Y Q N Q N/A Q

11. Is the application form certified by a responsible official stating that based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete? [R307-415-5d]

Y Q N Q

Prepare "Needs" List

Since air permit applications are required by environmental rules and regulations, a certain amount of background information and description of the existing facilities or modifications planned for existing facilities, or installation of new facilities. The details for preparing the engineering portions of the application may be collected in response to a "needs" list. Generally, the engineer prepares a list requesting specific information from staff familiar with the existing facility and the planned modifications, new installations or "Greenfield" new facilities at a new location. Typically, this type of list is similar to the start of any engineering task to collect the essential information for preparing design criteria, developing specifications, describing technical processes, identifying site characteristics, and documenting equipment characteristics. If the "needs" list is prepared in the same order as the air permit application checklist, then reviewing and organizing the information collected will be more efficient than using a randomized list. A typical "needs" list may be derived from the representative completeness checklist in Table A for a Title V air operating permit application.

Review "Needs" List

Organizing the "needs" list in the same order as the air permit application "checklist" will enable the reviewer to catalog all of the information efficiently. A randomized "needs" list would require repetitive "back-checking", which is a time-consuming procedure, to ensure that all of the collected information is correctly transferred to the proper location in the air permit application. The review of the "needs" list information requires many of the same techniques that engineers utilize to check and verify data before entering information in design criteria, specifications, drawings, and equipment capacities. Validating the information collected is efficient since "backtracking" to double-check the details later in the air permit application process may result in starting a section over again if some information is obviously out of the range of operation for the equipment selected or if design criteria and specifications are found to consist of erroneous or unrealistic information. For example, preparing emission calculations based upon an

incorrect production rate of 40 units per hour when, in reality, the equipment is actually designed for 400 units per hour could result in an unreasonably low air pollutant emission limit when the final permit is issued.

Preparing a "reality check" analysis of the information gathered for the "needs" list is vital to the preparation of an air permit application that will enable the facility to operate their new or modified equipment in compliance with the final permit issued by federal or state regulatory agencies. This type of review may also include checking the information collected with an Internet search of similar facilities, equipment, processes, and suppliers. Verifying data early in the air permit application process contributes to a more efficient preparation schedule and may also reduce the time to obtain a final permit.

Learn the Processes

After reviewing the "needs" list, the next step is to learn the processes that will be the main focus of the air permit application. Thoroughly understanding the types of processes and related equipment facilitates customizing drawings and documentation for the federal or state permit writers. Since the agencies typically compare the processes listed in the permit with laws, rules, guidance documents, and regulations, the efficiency for processing the permit is improved when the regulator understands the air permit application drawings and documentation when presented. This is typically an area where regulators who use this information to compare the request for permit with the pertinent rules and regulations for the specific process. For example, the rules regarding boiler installations are quite different from the rules regarding control of printing ink solvents. Methods to learn processes include the following:

EXISTING PROCESSES

- Inspect site
- Trace process through facility
- Review engineering drawings
- Review engineering documents
- Develop list of planned changes
- Review processes and changes with staff
- Prepare drawings showing existing and new processes
- Prepare summary of processes and changes
- Review summary with decision makers
- Publish process descriptions and drawings

NEW PROCESSES

- Determine installation locations
- Prepare process descriptions
- Prepare drawings showing new processes
- Research processes and suppliers on Internet

- Identify potential suppliers
- Prepare process specifications
- Request comparable air emission data
- Issue inquiries to suppliers
- Review supplier inquiries
- Determine supplier process feasibilities
- Prepare summary of feasible process
- Review summary with decision makers
- Publish process descriptions and drawings

Calculate the Air Emissions

Existing permitted facilities possess existing air permits that list allowable pollutant emissions, process variations, and capacities. In addition, facilities monitor existing air pollutant discharges on a continuous basis (24 hours per day, 7 days a week) or on an infrequent basis (monthly, quarterly, semi-annually, annually, and biannually). These resources provide averages and ranges for the regulated air pollutants discharged into the air. Existing permit requirements for testing and reporting of selected air pollutants provide a history of emissions that the federal and state regulatory agencies make available to the public. Sources based on actual air emission data include the Air Toxics Report, also known as "Form R" that summarizes emissions from major facilities, Title V permit applications that estimate emissions from each individual source of air pollutant discharges, and the U. S. Environmental Protection Agency (EPA) and trade association emission factors for processes and equipment at different facilities.

Another source of emission estimates is supplier information. The companies that design the operating procedures and manufacture the equipment for processes emitting regulated pollutants generally track the emissions at various capacities. The information is derived from actual measurements from pilot plant simulations or is estimated based on pollutant measurements from earlier models of the same equipment. Additional emission data for predicting air pollutant quantities is developed from balanced chemical or combustion stochiometry. Measuring the quantities of different reactive chemical raw materials or the quantities of different combustion fuels will enable the engineer to calculate estimated quantities of air pollutant discharges. The principle of surrogate testing, for example, is based upon the calculation of combustion products when burning fuel in a boiler. The boiler is operated with natural gas fuel of a known chemical composition, heat content, and purity, generally provided by the supplier of the natural gas. Direct measurements of the combustion gas pollutants operating at different boiler loads are analyzed for a period of approximately two weeks. During the measurement period, variables such as fuel flow, fuel heat content, fuel analysis, flame temperature, combustion air flow, combustion air and natural gas moisture content, are correlated with the air pollutant quantities emitted in the flue gas. A computer program is designed to calculate the combustion process variables to develop a range of surrogate parameters at different boiler operating conditions. This surrogate model correlates the input variables consisting of fuel & air flows plus the combustion conditions under various loads to predict the combustion

products and quantities of regulated pollutants. The model is calibrated by comparing the calculated model emissions with the actual measured emissions during the two-week evaluation period under different boiler operating conditions. When the computer program, representing the "combustion model" of the boiler, predicts emissions that match the measured emissions with a high degree of confidence, the performance of the boiler may then reflect the calculated emissions based only on the input parameters rather than on continuous flue gas analysis.

The critical step in an air permit application is the calculation of emissions from the existing facility compared to a modified or new facility. Existing facilities are typically operated below full capacity on an annual basis. For example, equipment downtime for repairs and maintenance, start-up and shut-down procedures, facility closing for holidays, unexpected process interruptions, and one or two shift operation instead of three shifts per 24 hour day,

Calculate Emission Inventory

One of the major features of a Title V operating permit application is an emission inventory. This type of permit is required by facilities listed in the federal and state regulations and all facilities that emit over 10 tons per year of a hazardous air pollutant (HAP) or over 25 tons per year of all hazardous air pollutants. Facilities meeting these emission criteria are considered major so that a complete Title V air operating permit application will be necessary. There are methods to review an existing facility to determine applicability of requiring a major Title V permit for a facility. Examples of the types of calculations and engineering analysis techniques for determining the applicability of Title V permitting are listed below in Calculation Set No. 1. Every source of a HAP or conventional pollutant discharge to the air becomes part of the emission inventory. The engineering tasks consist of researching emissions generated from similar equipment or process sources. Estimated air pollutant quantities are calculated from capacities multiplied by emission factors obtained from the EPA, state agencies, trade organizations, suppliers, and similar facilities. Calculated emissions that may change the type of permit required based upon quantity emitted may be checked by actual testing of the emission sources considered borderline in comparison to the permit classification criteria. Verifying the capacities of the emission sources becomes more critical in a borderline situation. Many states include similar calculation methods for minor, synthetic minor, and air construction or permit-to-install permit applications. Checking the calculations and the engineering assumptions are important to ensure that realistic emission limits are established in the final permit. This check also includes a "reality check" to ensure that the calculated results are realistic. Developing a volatile organic chemical (VOC) emission rate for a parts cleaner processing 5 gallons of a regulated solvent per hour are expected to have significantly lower evaporation losses than an automobile paint booth processing 100 gallons per hour. Developing the expertise and skill to readily identify calculated emissions that are not realistic is vital to achieving accurate final permit limits.

Calculation Set No. 1

Exemplary Procedures for Classifying a Facility as a Major Title V Source

Case Study I: Review of 10 ton/year criteria for one hazardous air pollutant (HAP)
A printing ink contains trace amounts of toluene. The price of the ink could double if the manufacturer changed to a different vehicle. Laboratory tests of the hood over the printing press using this ink measured toluene at an emission rate of 3 pounds per hour.

Step 1: Determine the quantity of toluene emitted annually.

$$\frac{3.00 \text{ lb}}{\text{hr}} \left| \frac{24 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{52 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 13.10 \frac{\text{tons}}{\text{year}}$$

Step 2: Compare calculated annual emissions of toluene with Title V Criteria.

Title V criteria defines emissions of more than 10 tons/year for one hazardous air pollutant (HAP) a major source. This calculated emission exceeds the criteria, therefore, a major title V permit application will be required for this facility utilizing this printing ink 24 hours a day and 7 days a week for a year.

Step 3: Evaluate alternatives

Alternative No. 1   Change to a similarly priced printing ink free of hazardous air pollutants.

Alternative No. 2   Pay the premium to re-formulate the existing printing ink to remove toluene and be free of this hazardous air pollutant.

Alternative No. 3   Change to two 8-hour shifts a day operation.

$$\frac{3.00 \text{ lb}}{\text{hr}} \left| \frac{16 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{52 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 8.74 \frac{\text{tons}}{\text{year}}$$

This calculated emission is below the criteria, therefore, a major title V permit application will <u>not</u> be required for this facility utilizing this printing ink 16 hours a day and 7 days a week for a year.

Alternative No. 4   Reduce the number of operating weeks to 39 weeks per year.

$$\frac{3.00 \text{ lb}}{\text{hr}} \left| \frac{24 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{39 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 9.83 \frac{\text{tons}}{\text{year}}$$

Selecting the most advantageous option is typically based upon professional engineering recommendations reviewed by facility managers and environmental staff.

For example, the most cost-effective option to recommend for this case study is to locate an acceptable printing ink substitute that does not contain any hazardous air pollutants in the formulation.

Case Study II: Review of 10 ton/year criteria for one hazardous air pollutant (HAP)

A packager of shampoo learned that over 5% of the formula contained glycerin and was concerned if the facility would be considered as a major Title V source. Testing of the air emissions from the packaging line indicated glycerin emissions of 4 pounds per hour.

Step 1: Determine the quantity of glycerin emitted annually.

4.00 lb	24 hr	7 days	52 weeks	ton	=	17.47	tons
hr	day	week	year	2,000 lb			year

Step 2: Compare calculated annual emissions of glycerin with Title V Criteria.

Title V criteria defines emissions of more than 10 tons/year for one hazardous air pollutant (HAP) a major source. This calculated emission exceeds the criteria, therefore, the initial evaluation considered this facility major source based on Title V criteria while continuing to use this shampoo formulation 24 hours a day and 7 days a week for a year. After consulting with an environmental permitting expert, the facility staff learned that Title V requirements for a major source were not met even with glycerin emissions over 17 tons per year. The consultant reviewed the list of hazardous air pollutants and pointed out that glycerin was absent from the list. Therefore, this facility is not a major title V source on the basis of glycerin emissions from the packaging of shampoo.

Engineering calculations with respect to environmental determinations are also affected by the pertinent regulations. This example demonstrates that verification of the type of pollutant is a critical first step to determine if a suspected chemical is listed as a hazardous air pollutant before testing and calculating alternatives.

Case Study III: Review of 25 ton/year criteria for all hazardous air pollutants (HAPs)

A resin compounder obtained test results for emissions before the final curing cycle. The testing laboratory reported vinyl acetate emissions of 1.5 pounds per hour, styrene emissions of 2.0 pounds per hour, and butadiene emissions of 2.2 pounds per hour.

Step 1: Determine the quantities of vinyl acetate, styrene, and butadiene emitted annually.

Vinyl Acetate

$$\frac{1.50 \text{ lb}}{\text{hr}} \left| \frac{24 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{52 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 6.55 \frac{\text{tons}}{\text{year}}$$

Styrene

$$\frac{2.00 \text{ lb}}{\text{hr}} \left| \frac{24 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{52 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 8.74 \frac{\text{tons}}{\text{year}}$$

Butadiene

$$\frac{2.20 \text{ lb}}{\text{hr}} \left| \frac{24 \text{ hr}}{\text{day}} \right| \frac{7 \text{ days}}{\text{week}} \left| \frac{52 \text{ weeks}}{\text{year}} \right| \frac{\text{ton}}{2,000 \text{ lb}} = 9.61 \frac{\text{tons}}{\text{year}}$$

Total of all all hazardous air pollutants   24.90 $\frac{\text{tons}}{\text{year}}$

Step 2: Compare calculated annual emissions of vinyl acetate, styrene, and butadiene with Title V Criteria.

Title V criteria defines unlisted facilities with emissions of more than 10 tons/year for one hazardous air pollutant (HAP) or 25 tons/year for all hazardous air pollutants as a major source. These calculated emissions do not exceed either criteria, therefore, a major title V permit application will not be required for this facility based upon these identified hazardous air pollutants utilizing the resin compounding ingredients 24 hours a day and 7 days a week for a year.

New or Modified Equipment

Changing processing capacity or adding air pollution controls generally require rebuilding existing equipment or installing new equipment. Identifying the type of equipment required is the first step. The second step is for the engineer to become familiar with the equipment by researching web sites, supplier literature, textbooks, similar facilities, and regulatory guidance documents. Collecting technical data consisting of equipment drawings, specifications, capacities, anticipated regulatory pollutants, and operating procedures is next. The organized material is then reviewed for technical feasibility and realistic emissions data for incorporation in the final air permit application.

Equipment Layout

After deciding on the type of equipment, the next phase is to locate each new or modified emission source or air pollution control device on a site plan. This type of drawing uses the universal transverse mercator (UTM) grid system for determining the specific coordinates for each stack or vent discharge point and adjacent equipment and buildings. This type of drawing consisting of an aerial view of the existing or planned new facility is also utilized for air modeling. Field verification with a global positioning

system (GPS) unit provides even more accurate identification for locating sources of air pollutant emissions. When an air model is required, accurate locations of stacks, vents, and adjacent buildings is important to demonstrate that generation of the regulated air emissions may not exceed any ambient (natural) air concentration standards.   When engineers and staff familiar with the process and the facility review these plan view drawings showing existing, modified, and new emission sources, air permitting strategies may be developed to minimize facility discharges of regulated pollutants.

Air Model Analysis

When federal or state emission limit criteria are exceeded for one or more pollutants, an air model may be required to determine if an ambient air quality standard continues to meet federal and state criteria.   An air model is a complex mathematical model that considers such factors as air emission velocity, pollutant concentration, discharge velocity, flow, temperature, stack or vent height, weather conditions, terrain, adjacent building elevations, and the facility property line. One technique for converting from one type of unit to another is to write the equations with the same units in both the numerator and denominator. These units will cancel out so that the new converted units remain in the equation. Examples of conversions from English units to Metric units for input parameters in environmental air models are shown in Calculation Set No. 2 below.

Calculation Set No. 2

Exemplary Conversions for Computer Air Model
Input Data from English Units to Metric Units

Stack Diameters, Stack Heights and Building Heights (feet to meters)

$$200.00 \ \text{ft} \left| \frac{\text{m}}{3.2808 \ \text{ft}} \right. = 60.96 \ \text{m}$$

Stack Exhaust Gas Velocity (feet/second to meters/second)

$$\frac{2{,}000 \ \text{ft}}{\text{sec}} \left| \frac{\text{m}}{3.2808 \ \text{ft}} \right. = 609.6 \ \frac{\text{m}}{\text{sec}}$$

Stack Exhaust Gas Flow (cubic feet/second to cubic meters/second)

$$\frac{20{,}000 \ \text{ft}^3}{\text{sec}} \left| \frac{\text{m}^3}{(3.2808)^3 \ \text{ft}^3} \right. = 566.36 \ \frac{\text{m}^3}{\text{sec}}$$

Stack Exhaust Gas Temperature (degrees Fahrenheit (^{o}F) to degrees Kelvin (^{o}K)

$$\frac{280.00 \quad ^oF \quad - \quad 32 \quad \Big| \quad 5}{\Big| \quad 9} \quad = \quad 137.78 \quad ^oC$$

$$\underline{137.78 \quad ^oC \quad + \quad 273.15} \quad = \quad 410.93 \quad ^oK$$

Pollutant Emission Flow (pounds/hour to grams/second)

$$\frac{10.00 \quad lb \Big| \quad\quad hr \quad\Big| \quad\quad min \Big| 454 \quad gm}{hr \Big| 60 \quad min \Big| 60 \quad sec \Big| \quad\quad lb} \quad = \quad 1.26 \quad \frac{gm}{sec}$$

Computerized air models may be downloaded from federal and state web sites or purchased from firms that specialize in air modeling.

In recent revisions of the air models, the ISC model has been deemed obsolete and replaced by the AERMOD computer air model detailed in Table B-1 below.

Table B-1 – Representative EPA Basic Air Models –
Atmospheric Dispersion Model (AERMOD)

Overview of the AERMOD Models

This overview summary may be obtained at the following website address:

http://home.pes.com/aermod.htm

At the 7th Modeling Conference held on June 28-29, 2000 in Washington, DC, the US EPA proposed AERMOD as a refined model for regulatory applications in simple and complex terrain.

The AERMOD model has been developed by the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC), with major contractual support from PES. This development effort, which began in 1991, was undertaken to introduce state-of-the-art modeling concepts into the EPA's air quality models. The focus of AERMIC was on upgrading regulatory steady-state plume modeling to incorporate air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

PES has supported the AERMOD development effort since 1993, including the development, testing, and documentation of the AERMOD code, evaluation of the AERMOD modeling system on a total of 10 data bases, and performing a meteorological data degradation analysis. PES

recently completed the implementation and evaluation of the improved building downwash algorithms from the ISC-PRIME model into AERMOD.

The AERMOD modeling system consists of three separate components: AERMOD (AERMIC Dispersion Model), AERMET (AERMOD Meteorological Preprocessor), and AERMAP (AERMOD Terrain Preprocessor). You can download the current versions of the AERMOD modeling system here, including source code, executable, test case, and user's guide:

AERMOD - Version 99351 (1.0 Mb)

AERMET - Version 99211 (1.3 Mb)

AERMAP - Version 99211 (1.8 Mb)

The EPA published a 91 page summary of this model in more detail accessible at the following website address:

http://www.epa.gov/scram001/7thconf/aermod/aermod_mfd.pdf

This computer air dispersion model consists of several components as listed in the Table of Contents of this EPA publication as follows:

5

Table of Contents

Table B-2 – Representative EPA Basic Air Models –
Industrial Source Complex Short Term Dispersion Model (ISCST)
and Industrial Source Complex Long Term Dispersion Model (ISCLT)

The basic air models consist of the Industrial Source Complex Short Term (ISCST3) computer program intended for brief periods of weather conditions such as hourly and the Industrial Source Complex Long Term (ISCLT3) computer program intended for extended periods of weather conditions such as monthly, seasonal, or annual for calculating ambient air emissions from the exhaust plume to the facility fence line and beyond. More detailed descriptions of these models are listed in Table B-2 below since there are still air permit applications on file that included this type of computer air model.

Overview of the ISC Models

Industrial Source Complex (ISC3) models consist of the Short Term (ISCST3) and Long Term (ISCLT3) models. The ISC models include a wide range of options for modeling air quality impacts of pollution sources, making them popular choices among the modeling community for a variety of applications.

Regulatory Applicability

The U.S. Environmental Protection Agency (EPA) maintains the Guideline on Air Quality Models which provides the agency's guidance on regulatory applicability of air quality dispersion models in the review and preparation of new source permits and State Implementation Plan (SIP) revisions. Regulatory application of the ISC3 models should conform to the guidance set forth in the Guideline, including the most recent Supplements. Any non-guideline application of the models should meet the requirements of the applicable reviewing agency, such as an EPA Regional Office, a State or a local air pollution control agency.

In general, regulatory modeling applications should be carried out in accordance with a modeling protocol that is reviewed and approved by the appropriate agency prior to conducting the modeling. The modeling protocol should identify the specific model, modeling options and input data to be used for a particular application.

ISC Short Term Dispersion Model (ISCST3)

The Industrial Source Complex Short Term model (ISCST3) provides options to model emissions from a wide range of sources that might be present at a typical industrial source complex.

The basis of the model is the straight-line, steady-state Gaussian plume equation, which is used with some modifications to model simple point source emissions from stacks, emissions from stacks that experience the effects of aerodynamic downwash due to nearby buildings, isolated vents, multiple vents, storage piles, conveyor belts, and the like.

Emission sources are categorized into four basic types of sources, i.e., point sources, volume sources, area sources, and open pit sources. The volume source and the area source may also be used to simulate line sources. The model algorithms used to model

1. each of four source types,

2. calculating dry deposition for point, volume, area and open pit sources,

3. calculating wet deposition,

4. calculations for simple terrain (defined as terrain elevations below the release height).

The ISC Short Term model accepts hourly meteorological data records to define the conditions for plume rise, transport, diffusion, and deposition. The model estimates the concentration or deposition value for each source and receptor combination for each hour of input meteorology, and calculates user-selected short-term averages. For deposition values, either the dry deposition flux, the wet deposition flux, or the total deposition flux may be estimated. The total deposition flux is simply the sum of the dry and wet deposition fluxes at a particular receptor location. The user also has the option of selecting averages for the entire period of input meteorology.

ISC Long Term Dispersion Model (ISCLT3)
The Industrial Source Complex Long Term model (ISCLT3) provides options to model emissions from a wide range of sources that might be present at a typical industrial source complex. The long-term model provides options for modeling the same types of sources as provided by the short-term model, ISCST3.

The basis of the model is the straight-line, steady-state Gaussian plume equation, which is used with some modifications to model simple point source emissions from stacks, emissions from stacks that experience the effects of aerodynamic downwash due to nearby buildings, isolated vents, multiple vents, storage piles, conveyor belts, and the like.

Emission sources are categorized into four basic types of sources, i.e., point sources, volume sources, area sources, and open pit sources. The volume source and the area source may also be used to simulate line sources. The model algorithms used to model

1. each of four source types,

2. calculating dry deposition for point, volume, area and open pit sources,

3. calculating wet deposition,

4. calculations for simple terrain (defined as terrain elevations below the release height).

The ISC long-term model uses input meteorological data that have been summarized into joint frequencies of occurrence for particular wind speed classes, wind direction sectors, and stability categories. These summaries, called STAR summaries for STability ARray, may include frequency distributions over a monthly, seasonal or annual basis. The long term model cna be used to calculate concentration or dry deposition values for each separate STAR summary input and/or for the combined period covered by all available STAR summaries. Since the wind direction input is the frequency of occurrence over a sector, with no information on the distribution of winds within the sector, the ISC long-term model uses a Gaussian sector-average plume equation as the basis for modeling pollutant emissions on a long-term basis.

Basic Input Data Requirements and Options
There are two basic types of inputs that are needed to run the ISC models. They are

1. the input runstream file, and

2. the meteorological data file.

The runstream setup file contains the selected modeling options, as well as source location and parameter data, receptor locations, meteorological data file specifications, and output options. The ISC models offer various options for file formats of the meteorological data. A third type of

input may also be used by the models when implementing the dry deposition and depletion algorithm. The user may optionally specify a file of gridded terrain elevations that are used to integrate the amount of plume material that has been depleted through dry deposition processes along the path of the plume from the source to the receptor.

Other major options for ISC3 models are:

- Dispersion Options

- Source Options

- Receptor Options

- Meteorology Options

- Output Options

- Source Contribution Analyses

Dispersion Options

Since the ISC3 models are especially designed to support the EPA's regulatory modeling programs, the regulatory modeling options are the default mode of operation for the models. These options include the use of stack-tip downwash, buoyancy-induced dispersion, final plume rise (except for sources with building downwash), a routine for processing averages when calm winds occur, default values for wind profile exponents and for the vertical potential temperature gradients, and the use of upper bound estimates for super-squat buildings having an influence on the lateral dispersion of the plume. The user can easily ensure the use of the regulatory default options by selecting a single keyword on the modeling option input card.

To maintain the flexibility of the model, the non-regulatory default options have been retained, and by using descriptive keywords to specify these options it is evident at a glance from the input or output file which options have been employed for a particular application. The user may select either rural or urban dispersion parameters, depending on the characteristics of the source location. The user also has the option of calculating concentration values or deposition values for a particular run.

Source Options

The model is capable of handling multiple sources, including point, volume, area and open pit source types. Line sources may also be modeled as a string of volume sources or as elongated area sources. Several source groups may be specified in a single run, with the source contributions combined for each group. This is particularly useful for Prevention of Significant Deterioration (PSD) applications where combined impacts may be needed for a subset of the modeled background sources that consume increment, while the combined impacts from all background sources (and the permitted source) are needed to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). The models contain algorithms for modeling the effects of aerodynamic downwash due to nearby buildings on point source emissions, and algorithms for modeling the effects of settling and removal (through dry deposition) of large particulates.

The model also contains an algorithm for modeling the effects of precipitation scavenging for gases or particulates. Source emission rates can be treated as constant throughout the modeling period, or may be varied by month, season, hour-of-day, or other optional periods of variation. These variable emission rate factors may be specified for a single source or for a group of sources.

Receptor Options

The ISC3 models have considerable flexibility in the specification of receptor locations. The user has the capability of specifying multiple receptor networks in a single run, and may also mix Cartesian grid receptor networks and polar grid receptor networks in the same run. This is useful for applications where the user may need a coarse grid over the whole modeling domain, but a

denser grid in the area of maximum expected impacts. There is also flexibility in specifying the location of the origin for polar receptors, other than the default origin at (0,0) in x,y, coordinates.

The user can input elevated receptor heights in order to model the effects of terrain above (or below) stack base, and may also specify receptor elevations above ground level to model flagpole receptors. For simple terrain calculations, any terrain heights input above the release height for a particular source are "chopped-off" at the release height for that source's calculations. The Short Term model includes the complex terrain algorithms from the COMPLEX1 screening model. If these algorithms are used, the model will calculate impacts for terrain above the release height. The Long Term model does not include any complex terrain algorithms.

Meteorology Options

The Short Term model can utilize the unformatted, sequential files of meteorological data generated by the PCRAMMET and the MPRM preprocessors, provided the data file was generated by the same Fortran compiler as was used for the model, and provided the deposition algorithms are not being used.

The user also has considerable flexibility to utilize formatted ASCII files that contain sequential hourly records of meteorological variables. For these hourly ASCII files, the user may use a default ASCII format, may specify the ASCII read format, or may select free-formatted reads for inputting the meteorological data. A utility program called BINTOASC is provided with the ISC3 models to convert unformatted meteorological data files of several types to the default ASCII format used by ISCST and ISCEV. This greatly improves the portability of applications to different computer systems. The model will process all available meteorological data in the specified input file by default, but the user can easily specify selected days or ranges of days to process.

The Short Term model includes a dry deposition algorithm and a wet deposition algorithm. The dry deposition algorithm requires additional meteorological input variables, such as Monin-Obukhov length and surface friction velocity, that are provided by the PCRAMMET preprocessor. The wet deposition algorithm in the Short Term model also needs precipitation data, which is optionally available in the PCRAMMET preprocessed data. When using the dry deposition or wet deposition algorithms in ISCST, the meteorological data must be a formatted ASCII file.

The Long Term model uses joint frequency distributions of wind speed class, by wind direction sector, by stability category, known as STAR (STability ARray) summaries. These STAR summaries are available from the National Climatic Data Center in Asheville, North Carolina. They may also be generated from sequential data files using the STAR utility program available on EPA's SCRAM Bulletin Board System or by the MPRM meteorological processor for on-site data. The meteorological data for ISCLT are read in from a separate data file, and the user may use a default ASCII format or may specify the ASCII read format for the data.

Output Options

The basic types of printed output available with the Short Term model are:

1. Summaries of high values (highest, second highest, etc.) by receptor for each averaging period and source group combination;

2. Summaries of overall maximum values (e.g., the maximum 50) for each averaging period and source group combination; and

3. Tables of concurrent values summarized by receptor for each averaging period and source group combination for each day of data processed. These "raw" concentration values may also be output to unformatted (binary) files.

For the Long Term model, the user can also select output tables of values for each receptor, and/or tables of overall maximum values. The tables by receptor and maximum value tables can be output for the source group values or for the individual source values, or both. In addition, when maximum values for individual sources are output, the user has the option of specifying whether the values are to be the maximum values for each source independently, or the contribution of each source to the maximum group values, or both.

In addition to the tabular printed outputs, the ISC models provide options for several types of file output products. One of these options for ISCST is to output an unformatted ("binary") file of all concentration and/or deposition values as they are calculated. These files are often used for special postprocessing of the data. In addition to the unformatted concentration files, ISCST provides options for all additional types of file outputs. One option is to generate an ASCII formatted file with the same results that are included in the unformatted postprocessing file. Another option is to generate a file of (X,Y) coordinates and design values (e.g., the second highest values at each receptor for a particular averaging period and source group combination) that can be easily imported into many graphics plotting packages to generate contour plots of the concentration and/or deposition values. Separate files can be specified for each of the averaging period and source group combinations of interest to the user.

Another output file option of the ISCST model is to generate a file of all occurrences when a concentration or deposition value equals or exceeds a user-specified threshold. Again, separate files are generated for only those combinations of averaging period and source group that are of interest to the user. These files include the date on which the threshold exceedance occurred, the receptor location, and the concentration value.

Source Contribution Analyses

In air quality dispersion modeling applications, the user may have a need to know the contribution that a particular source makes to an overall concentration value for a group of sources. This section provides a brief introduction to how these types of source contribution (sometimes referred to as source culpability) analyses are performed using the ISC3 models.

Recognizing that source contribution information is important to many short term modeling analyses, the ISCST model has been designed to facilitate performing this type of analysis. This is accomplished with an additional model, referred to as the ISC Short Term - EVENT model (ISCEV). The ISCST model treats source groups independently. The ISCEV (EVENT) model is set up specifically to provide the contributions from individual sources to the concentration values for particular events. These events may be the design concentrations (e.g., the high-second-high 24-hour average concentration for a particular group of sources) that were generated from an execution of the ISCST model.

Other events of interest might be occurrences of violations of a particular standard, for which it is necessary to determine whether the source being permitted contributes above a significance level. The models are set up in such a way that both of these types of events can be passed directly from an execution of the ISCST model to an input file for the EVENT model. The user is thus able to run the models in a batch mode to obtain the overall design value results from ISCST and the source contribution information from ISCEV in a single step. The EVENT model can also be run separately and accepts user-specified events for source contribution processing.

In the ISCLT model, the user has an option to have the highest 10 values for each source and source group reported independently, or to have the 10 highest values from the combined source group and the contributions from the individual sources to those highest group values.

Most of the states have added air model experts to their staffs to verify results presented in the air permit application. The regulators also typically select the "worst-case" weather conditions at or near the facility for calculating estimated environmental impacts in and around the facility. Some states require including "worst-case " weather conditions and the maximum potential-to-emit pollutant quantities in the air model submitted with the air permit application to ensure that ambient air quality standards will be met even under these extreme conditions. Considerable specialized skills are required to ensure accuracy of the input data, change the units to agree with the model, input state-provided weather data, place mathematical receptors on a plot plan of the facility and surrounding area, run the model, and interpret the results. When the federal or state air model criteria and results are satisfactory demonstrating compliance with National Ambient Air Quality Standards (NAAQS), the requested air pollution limits are generally approved in the final issued permit. A representative air model completeness

checklist is listed in Table C below.

Table C – Representative Air Model Completion Checklist

NDEP-BAPC ENVIRONMENTAL EVALUATION (MODELING) CHECKLIST

Facility Name & Permit No. _____

Type of Permit Application .

Facility Location _____   **Date Completed** _____   **Modeler Name/Firm** _____

		✓
	Modeling Protocol Submission (Optional but Recommended)	✓
1	Applicant submitted proposed modeling protocol to NDEP-BAPC for agency review/comment **prior** to any modeling?	
	Environmental Evaluation Data to be Prepared by the Applicant	✓
2	Detailed facility plot plan drawn to appropriate scale, which <u>clearly</u> shows all fence lines/property-lines, topography, emission units, stacks, storage tanks, facility buildings & roof heights, public roads, neighboring properties, etc.	
3	Emissions inventory spreadsheet of all regulated pollutants (PM, PM_{10}, SO_2, NO_x, CO, VOCs, Pb, HAPs, and H_2S) emitted from <u>all</u> emission units and insignificant activities and submitted in hardcopy and electronic formats?	
4	Spreadsheet uses appropriate EPA AP-42 emission factors, manufacturer's data, and/or facility stack test results?	
5	Applicant researched/considered appropriate ambient background values for all pollutants modeled?	
6	Facility's modeling receptor grids are appropriately spaced and reflect surrounding terrain (e.g., flat or complex)?	
7	Complex terrain (terrain > stack height) modeling runs incorporate appropriate terrain height data (e.g., USGS)?	
8	Effects of nearby facilities (co-located facilities, facilities sharing a common fence line/property-line) considered?	
	Dispersion Modeling Runs	✓
9	Uses an EPA-approved/recommended dispersion model appropriate for the task (e.g., ISCST3)?	
10	NDEP-BAPC agrees with use of the selected meteorological data set?	
11	Modeled all criteria pollutants at the requested permit emission limits (including all insignificant activity emissions)?	
12	Highest impact for each pollutant/averaging time + background shows attainment with all NV ambient standards?	
13	Modeled secondary pollutants such as ozone - O_3 (e.g., Scheffe screening analysis or ISCST3)?	
14	Model incorporates appropriate operating schedule (e.g., 24 hrs/day or a lesser operating schedule such as 8-5)?	
15	Model runs apply appropriate building downwash effects for all affected stack sources (e.g., BPIP)?	
16	Model runs distinguish correctly between stack (point), process fugitive (volume), and area source emissions? sources?	
	Final Modeling Report (included as part of application submittal)	✓
17	Modeling report includes appropriate summary narrative (e.g., write-up) , data tables, plot plan, maps, figures, etc?	
18	Data provided is illustrative and clearly demonstrates compliance with all appropriate ambient standards?	
19	Modeling report includes appropriate hardcopy printouts of all plots (graphs) and model run outputs?	
20	Modeling report includes electronic (diskette or CD-ROM) input/output files and meteorology data set?	

<u>Best Available Control Technology</u>

The EPA reviews state permit limits to develop a list of the lowest emissions for individually regulated processes and equipment. This list is known as the "RACT/BACT/LAER Clearinghouse (RBLC)." This reasonably achievable control technology (RACT), best available control technology (BACT), and lowest achievable emission rate (LAER) Clearinghouse provides the information required for the "BACT" analysis required in new source review (NSR) or prevention of significant deterioration (PSD) major permits. In addition, many states require a "BACT" analysis for state air construction or "permit-to-install" permits based upon the type of facility and the quantity of potential emissions on a ton per year basis. The clearinghouse list of emissions provides the lowest air pollution rates from issued permits throughout the United States. This list, however, is not always trustworthy. Errors in entries and postings are prevalent. As a result, verification of what appears to be unrealistically low emission limit entries are typically confirmed by contacting the state regulatory agency that originally posted the information. In addition, some entries may reflect a new and novel technology that may not be applicable to the type of unit that is part of the permit application in process.

Since the RBLC entries are calculated from many different sources, the emission limit units may also be considerably different for the same type of equipment. The types of units for describing emission limits may include pounds per million British thermal units (lbs./mmBtu), pounds per hour (lbs/hr), grains per dry standard cubic foot (gr./dscf), or tons per year (T/yr). In addition to setting emission limits in English units, new EPA regulations are basing emission limits in metric units such as kilograms per cubic meter (Kg/m^3) and metric tons per year (t/yr). A representative BACT analysis completeness checklist is listed in Table D below.

Table D Representative Best Available Control Technology
(BACT) Analysis Completeness Summary

This form must be submitted by all applicants when Best Available Control Technology ("BACT") is required, except for small sources that utilize BACT as listed on the APCD's *Small Source BACT List*, for which case this form is not required. This form supplements APCD Regulation II and applicable APCD application guideline documents. Please fill in all sections of this form completely. Also, fill in a separate form for each emissions unit subject to BACT (multiple units with the same BACT may use only one form). Use additional sheets as necessary.

COMPANY NAME: _____ DATE: _____

FACILITY\SOURCE NAME: _____

1. POLLUTANT(S) SUBJECT TO BACT REVIEW: _____

2. EMISSION UNIT(S)/PROCESS(ES) SUBJECT TO BACT REVIEW: _____
    __

    _____

3. BACT SUMMARY:

    Technology: _____

    _____
    Performance Standard: _____

    _____

4. BACT SELECTION PROCESS DISCUSSION: On a separate sheet of paper, describe the justification for the selected control technology as BACT. Include the following in your description: documentation of technical infeasibility which would preclude the use of a more effective control technology; operating conditions at which the maximum daily and hourly emissions will be generated (baseline parameters); maximum daily and hourly emissions at the baseline conditions and the basis of how the emission rates were estimated; calculations, emission data, and/or other information to determine control effectiveness of each potential control technology; and emission limits expressed both in terms of an emissions cap (e.g., pounds per day) and in terms which ensure compliance at any operating capacity (e.g., pounds per million British thermal units, or parts per million by volume).

APPLICATION No

5. BACT EFFECTIVENESS: Discuss how BACT will be effective over all operating ranges.

_____

_____

_____

6. BACT DURING NON-STANDARD OPERATIONS: Discuss whether the proposed BACT is achievable during non-standard operations and if not, what BACT is for those operations.

_____

_____

7. OPERATING CONSTRAINTS: Identify all process variables for which operating limits need to be set in order to ensure compliance with the selected BACT standards.

_____

_____

_____

8. MONITORING BACT: Describe, in detail, how the selected BACT is to be monitored for its emission reduction effectiveness.

_____

_____

_____

9. ALTERNATE BASIC EQUIPMENT: Discuss whether alternate basic equipment (e.g., electric motors in lieu of IC engines) can be applied to this application.

_____

_____

10. [ ] Yes   [ ] No   Will this be a multi-year and/or multi-phase project?

11. [ ] Yes   [ ] No   Are all referenced documents attached?

12. [ ] Yes   [ ] No   If PSD BACT is triggered, was a detailed Top-Down BACT Analysis prepared and submitted with the application? Please be aware that the applicant is responsible for providing the APCD with this analysis.