United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

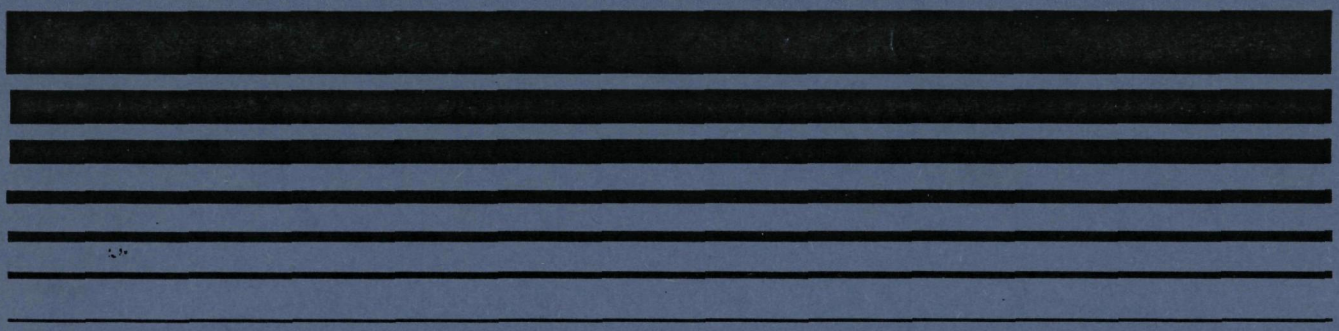
EPA 453/R-94-026
May 1994

Air

EPA

Guidelines for MACT Determinations under Section 112(j)

FINAL



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Final
May 1994

Table of Contents

LIST OF FIGURES

Introduction

This guidance document is designed to clarify the statutory and regulatory requirements for MACT determinations as required by Section 112(j) of the Clean Air Act as amended in 1990 (the Act). It sets forth procedures for determining emission limitations based on maximum achievable control technology for major sources who are required to apply for a new Title V permit, revise an existing permit, or apply for a Notice of MACT approval because the promulgation deadline for a MACT standard is missed by greater than 18 months for an applicable source category.

The manual is divided into five chapters and a four section appendix. Chapter 1 of this manual provides an overview of the statutory and regulatory requirements and discusses the procedures for applying for a Notice of MACT approval. Chapter 2 outlines the criteria a permitting agency should use when evaluating applications as well as possible approaches permitting agencies may use for determining the appropriate level of control for each source. Chapter 3 describes the process for selecting a control technology that meets the criteria discussed in Chapter 2. Chapter 4 provides a detailed discusion on determine the minimum level of control that can be applied to a source (the MACT floor). Chapter 5 briefly discusses some calculation procedures for the equivalent (MACT) emission limitation. Chapter 6 describes the analysis that may be required to assess

the costs of achieving the emission reduction, and any non-air quality health and environmental impacts and energy requirements associated with use of different control options. Chapter 7 discusses the national databases that may assist in the collection of available information.

Part A of the Appendix illustrates examples for defining a MACT-affected emission unit, and selecting a control technology to meet MACT. Part B is a question and answer forum. It is designed to deal with detailed questions on applicability and other issues. Part C of the Appendix contains a glossary of terms and definitions. In Appendix D, a complete list of source categories of major sources is provided. This listing is current only to the date of this publication. Readers are referred to the Federal Register for any changes to this listing.

It is hoped that this guidance document contains useful information for implementation of MACT determinations. For more information on MACT determinations, the reader is advised to read 40 CFR Part 63, Subpart B, and Section 112 of the Act.

Final
May 1994

Chapter 1.0

An Overview of the MACT Determination Process for Section 112(j)

1.1 Overview of Statutory Requirements

Beginning after the effective date of an approved permit program, (but no sooner than May 15, 1994,) Section 112(j) of the Clean Air Act as amended in 1990 (The Act), requires an owner or operator of a major source to submit either a new Title V permit application or a revise an existing permit if such major source is part of a source category for which the promulgation deadline for a relevant Section 112(d) or 112(h) standard has been missed by 18 months. The promulgation deadline for each source category was established through the regulatory schedule in accordance with Section 112(e) of the Act. A final regulatory schedule was published on December 3, 1993 in the Federal Register (58 FR 63941).

Section 112(j) also requires States or local agencies with approved permit programs to issue permits or revise existing permits for all of these major sources. These permits must contain either an equivalent emission limitation or an alternate emission limitation for the control of hazardous air pollutants (HAPs) from the major source. An equivalent emission limitation, also referred to as a MACT emission limitation, will be determined on a case-by-case by the permitting agency for each

source category that becomes subject to the provisions of Section 112(j). The MACT emission limitation will be "equivalent" to the emission limitation that the source category would have been subject had a relevant standard been promulgated under Section 112(d) (or Section 112(h)).

In accordance with Section 112(d), the MACT emission limitation will require a maximum degree of reduction of hazardous air pollutant emissions (HAPs) taking into consideration the costs of achieving such emission reductions, and any non-air quality health and environmental impacts and energy requirements. For new sources, the MACT emission limitation will be no less stringent than the emission control that is achieved in practice by the best controlled similar source. For existing sources the MACT emission limitation will be no less stringent than:

> the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emissions information), excluding those sources that have, within 18 months before the emission standard is proposed or within 30 months before such standard is promulgated, whichever is later, first achieved a level of emission rate or emission reduction which complies, or would comply if the source is not subject to such standard, with the lowest achievable emission rate (as defined by Section 171 (of the Act)) applicable to the

source category and prevailing at the time, in the category or subcategory for categories and subcategories with 30 or more sources; or,

the average emission limitation achieved by the best performing 5 sources (for which the Administrator has or could reasonably obtain emissions information) in the category or subcategory for categories or subcategories with fewer than 30 sources.

These minimum requirements for the MACT emission limitation for new and existing sources are termed the "maximum achievable control technology (MACT) floor".

An alternate emission limitation is a voluntary emission limitation that an owner or operator of a major source has agreed to achieve through the early reductions program. (See 57 FR 61970.) The alternate emission limitation can be written into the permit in lieu of an equivalent emission limitation only if the source has achieved the required reduction in HAP emissions before the missed promulgation deadline for the relevant Section 112(d) (or 112(h)) standard.

Section 112(j) also requires EPA to establish requirements for owners or operators and reviewing agencies to carry out the intent of Section 112(j). These requirements are contained in Chapter 40, Part 63, Subpart B of the Code of Federal Regulations.

1.2 Overview of the Regulatory Requirements

The owner or operator of a major source is required to apply for a Title V permit, when the promulgation deadline for a relevant Section 112(d) or Section 112(h) emission standard is missed. For existing sources, the permit application must be received by the permitting agency no later than 18 months from the date that the promulgation deadline is missed (the Section 112(j) deadline or "hammer date"). For new sources, this permit application must be received within 12 months after commencing operation, but not sooner than the Section 112(j) deadline. Section 63.53 of Chapter 40 of the Code of Federal Regulations lists the information required for a complete permit application submittal.

In addition to the requirement to submit a permit application, EPA also recommends that an owner or operator of a proposed new or reconstructed source be required to obtain a Notice of MACT Approval. This recommendation is discussed in greater detail in Section 1.3 of this chapter.

Ideally, the Administrator or permitting agency will notify the major source of a projected source category equivalent emission limitation based on a preliminary assessment of the MACT floor finding and the MACT before the Section 112(j) deadline. When such information is made available to the source before this deadline, the permit application must demonstrate how the major source will achieve the projected level of control. The

applicant may also chose to include an analysis that supports an alternate level of control. This information should be considered by the permitting agency before final issuance of the Title V permit. Applicants who wish to support an alternate level of control should refer to the guidance contained in Chapters 3 and 4 to develop such an alternative.

If the Adminsitrator or permitting agency fails to provide the source with a projected equivalent emission limitation before the Section 112(j) deadline, the applicant is not required to include a control technology demonstration in the complete permit application submittal. Once the permitting agency determines the level of control required for the source category, the permitting authority may request additional information from the applicant at that time. The applicant should supply this information to the permitting agency as expeditiously as practicable.

1.3 Administrative Review Process for New Sources

Some owners or operators may be required to obtain a Title V permit revision if a source's existing Title V permit prohibits the construction of a new source or reconstruction of an existing source without first obtaining a permit revision. However, when a revision to a permit is not specifically required in advance of the major source change, and an owner or operator does not voluntarily revise or obtain the Title V permit before construction, the source is not required to apply for a Title V permit until 12 months after operation. It may take upto an additional 18 months before an approved permit is issued. This delay between the actual construction date and permit issuance date can create problems for both the permitting agency and the major source. In recognition of these potential problems, Subpart B of 40 CFR Part 63 allows a permitting agency to include a preconstruction review process as part of its Section 112(j) program. This process would require owners and operators of major sources to undergo preconstruction review before constructing a new source or reconstructing an existing source, if construction is to commence after the Section 112(j) deadline.

Providing for a preconstruction review process under such circumstances is advantageous for both the major source and the permitting agency. Because of the different requirements of Section 112(j) and Section 112(g) of the Act, a source may be

required to undergo a preconstruction review under Section 112(g) if it proposes to modify, construct or reconstruct the major source. If Section 112(g) considers the change at the major source to be a modification, the source would only be required to comply with an existing source MACT level of control. The same activity at the major source may also qualify as construction of a new source under Section 112(j). It is then required to meet a new source level of control. A preconstruction review program under Section 112(j) would allow for early recognition of such overlaps and ensure that the major source is taking proper action to comply with the more stringent requirement. In addition, it provides the source with an opportunity to interact with the permitting agency before construction to build proper controls into the upfront designs and avoid the need to retroactively fit state of the art controls.

As part of the preconstruction review process, the permitting agency could issue the major source a Notice of MACT Approval. This notice serves as a mechanism to ensure federal enforceability of the requirements established during the preconstruction review before such requirements are incorporated into the Title V permit. If the preconstruction review process meets the substantive requirements of Title V, the requirements of the Notice of MACT could be incorporated into the Title V permit through administrative amendment. Section 63.54 of Subpart B explains the necessary elements of a pre-construction

review process to convey federal enforceability and allow the requirements in the Notice of MACT Approval to be administratively amended into the Title V permit. Figure 1 provides a suggested format for the Notice of MACT Approval.

air pollutant.

In addition to specifying the MACT emission limitation, the the permit should establish the terms and conditions that are necessary to make the emission limitation federally enforceable as a legal and practical matter. This involves establishing appropriate operational or production limits and monitoring parameters to ensure compliance with the MACT emission limitation. The following section discusses compliance provisions in greater detail.

2.2 Compliance Provisions

Each Title V permit and Notice of MACT approval must contain sufficient testing, monitoring, reporting, and recordkeeping requirements to ensure that the MACT emission limitation is federally enforceable as a legal and practical matter.

In order to be federally enforceable, operational limits or production limits must be imposed on the source in addition to a blanket emission limitation. For example, a blanket 40 tpy MACT emission limitation on HAPs would not be federally enforceable. In addition to the blanket emission limitation, a source may be required to comply with a production limitation that limits the amount of gallons used per hour in the operation; or the source may be required to comply with an operational limitation on its hours of operation to assure that the blanket emission limitation can not be violated through normal operations.

Production limits are restrictions on the amount of final product which can be manufacture or otherwise produced at the source. Operation limitations are other restrictions on the manner in which a source is run. Operation limitations include limits on quantities of raw material consumed, fuel combusted, hours of operation, or conditions which specify that the source must install and maintain controls that reduce emissions to a specified emission rate or level.

When the permit or Notice of MACT Approval requires an add-on control, operating parameters and assumptions that can be used

to determine the efficiency or emission rate of the devise should be specified in the document. For example, a source may have a MACT emission limitation that requires a control devise to be installed and operated at a 95% efficiency rate. An operational limit on the range of temperatures that the devise can be operated under could be sufficient to ensure federal enforceability, if operating the control devise within this temperature range ensures that the devise achieves a 95% destruction efficiency.

If establishing operating parameters for control equipment is infeasible in a particular situation, a short term emission limit (e.g. lbs/hr) would be sufficient provided that such limits reflect the operation of the control equipment, and additional requirements are imposed to install, maintain, and operate a continuous emission monitoring system (CEM) or other periodic montioring that yields sufficiently reliable data to determine the source's compliance with the MACT emission limitation. Such monitoring may be instrumental or non-instrumental and may consist of recordkeeping designed to serve as monitoring.

If parameter monitoring of a production or operational limit is infeasible due to the wide variety of coatings or products used or the unpredictable nature of the operation, emission limits coupled with a requirement to calculate daily emissions may be required. For instance, a source could be required to keep the records of the daily emission calculation, including

daily quantities and the HAP content of each coating used.

For either operation or production limitations to be enforceable as a practical matter, the limitations should extend over the shortest practicable time period, generally not to exceed one month. If it is not practicable to place a monthly limit on the source, a longer time can be used with a rolling average period. However, the limit should not exceed an annual limit rolled on a monthly basis.

In addition to conveying practical enforceability of a MACT emission limitation, the Title V permit or Notice of MACT Approval should require testing or instrumental or noninstrumental monitoring that yields data this is representative of the source's operations and can be used to certify the source's compliance with the terms and conditions of the Title V permit or Notice of MACT Approval. Such testing or monitoring requirements may be in the form of continuous emission monitoring systems, continuous opacity monitoring systems, periodic testing, or it may consist of recordkeeping designed to serve as monitoring. If periodic testing is required, the specific EPA approved method or equivalent method that is to be used should be specified in the permit or notice.

2.3 Approaches to the MACT Determination

When the Administrator fails to promulgate a standard by the promulgation deadline, the EPA intends to make all non-confidential information collected during the development of a source category standard available to the public. If the Administrator has conducted a MACT floor finding, this analyze will be made available as well. Information will be conveyed either through a Federal Register notice, a background information document, the Technology Transfer Network (TTN), MACT database or other available mechanism.

A permitting agency could use several different approaches for the MACT determination process. An agency could wait until all applications for permits are received to determine the equivalent emission limitations that would apply to all of the sources. Or, an agency or a group of agencies could conduct a "MACT analysis" based on available information before the Section 112(j) deadline.

The first approach requires less upfront coordination on the part of the permitting agency and is likely to be used when EPA fails to collect sufficient information on the source during the standards development process. Once the permit applications are received, information from each application can be compiled to determine the appropriate emissions control level. When this approach is used, EPA strongly encourages different permitting

agencies to share information received through the permit application process. For some source categories, permit application information may be downloaded into the MACT database after the Section 112(j) deadline. After the appropriate level of control is determined using the permit application information, several permit applicants may need to submit additional information to demonstrate how the source will meet the required emission reductions.

The second approach conveys information to an applicant before the initial application submittal. This approach is most likely to be used when there is a substantial amount of information already available for a source category, or when EPA has already proposed standards for that source category. Based on this available information, the permitting agency (or coalition of permitting agencies) would conduct a MACT analysis (See Chapter 3) to determine the appropriate level of control for each source. This control level could be made federally enforceable for all sources in the category through the use of general permits, or each applicant could undergo a separate review in the Title V permitting process. Section 2.5 discusses the concept of general permits in greater detail.

Regardless of the approach taken to issue or revise Title V permits under Section 112(j), permitting agencies are reminded that the equivalent emission limitation is to be determined on a case-by-case based for each source category for which a Section

112(j) MACT determination is required. This determination should be viewed as a "source category-by-source category" determinations and terms and conditions in each permit issued should yield an essentially equivalent degree of emission reductions for all major source in the category.

2.4 Available Information

Section 112(j) states that permits issued pursuant to Section 112(j) shall contain an equivalent emission limitation. This emission limitation is to be "equivalent" to that which the source would have been subject had an applicable Section 112(d) or Section 112(h) emission standard been promulgated. In order to establish an emission limitation that would be equivalent, the permitting agency must determine the equivalent emission limitation with consideration to the MACT floor using available or reasonably available emissions information.

For the purposes of a Section 112(j) MACT determination, emission information is considered available or reasonably obtainable to the permitting agency if the information can be obtained from EPA's Office of Air Quality, Planning and Standards, the EPA's National MACT database or other publically available databases (See Chapter 6), from State or local agencies or within the permitting agency itself. A permitting authority is not required to obtain additional information from databases or other State and local agencies if EPA provides the permitting agency with sufficient information to make the MACT determination. This information could be made available through a proposed rule, Federal Register notice, Background Information Document (BID), the MACT Database, a memo to the permitting agency, or through another available mechanism.

It is not necessary for the MACT floor to be determined

based on emissions information from every existing source in the source category if such information is not available. Once a permitting agency has obtained available information, the MACT floor can be determine using this information if it is representative of the source category. For example, suppose there are 100 sources in a source category. Control technology X and Y are generally considered to achieve the greatest amount of emission reductions among existing sources. Thirty sources in the category use these technologies. The MACT floor could be determined based on these technologies, even if information was not available on the other seventy sources.

2.5 General Permits

A general permit is a type of Title V permit. A single general permit could be issued by a permitting authority to cover a number of sources. The specific requirements for a general permit are contained in 40 CFR Part 70.6(d).

The general permit can be written to set forth requirements for an entire source category, or portion of the source category. The facilities that are covered by the general permit, should be homogenous in terms of operations, processes, and emissions. In addition, the facilities should have essentially similar operations or processes and emit pollutants with similar characteristics. The facility should be subject to the same or substantially similar requirements governing operations, emissions monitoring, reporting, or recordkeeping.

Because the case-by-case determination under Section 112(j) is a source category-by-source category determination of an equivalent emission limitation, the permitting agency could use the general permit as a mechanism to issue Title V permits to the entire source category, or specific emission units within the source category. By using this mechanism, a permitting agency would not be required to issue individual permits to sources covered by the general permit. Also, once the general permit has been issued and after opportunity for public participation, EPA review and affected State review, the permitting authority may grant or deny a source's request to be covered by a general

permit without further outside review.

Major sources that do not require a specific Title V permit for any other reason, could be covered by the general permit indefinitely. For a major source that already has a Title V permit, the owner or operator can apply for coverage under the general permit, and then incorporate the general permit requirements into the source specific permit through an administrative amendment at permit renewal.

General permits would not be an appropriate mechanism to issue permit conditions if the terms and conditions necessary to establish federal enforceability as a legal and practical matter might vary from source to source within the category. For instance, if a MACT emission lmiitation restricted emissions from multiple emission points within the source category and the number of emission points varied from major source to major source, a general permit may not be appropriate.

Chapter 3

The MACT Analysis

For most source categories, the process of determining the appropriate level of control involves a number of different determinations. First, the emission points at the major source that are related to the activities and equipment associated with a source category must be identified. There may be a number of emitting activities and equipment at a single major source. In some cases, not all of these emissions are from a single source category. Only the emission points associated with the source category undergoing the Section 112(j) MACT determination are subject to control through an equivalent emission limitation.

After the scope of the source category is determined, the emission units within that source category must be identified. A single source category may have only one emission unit comprised of all of the emission points; or, it may have several emission units each comprised of some portions of the total number of emission points. For each emission unit, the new source MACT and existing MACT and the cooresponding MACT emission limitations must be established.

The process by which these determinations are made is termed the MACT analysis. The following sections of this Chapter describe a MACT analysis process that EPA has developed to meet

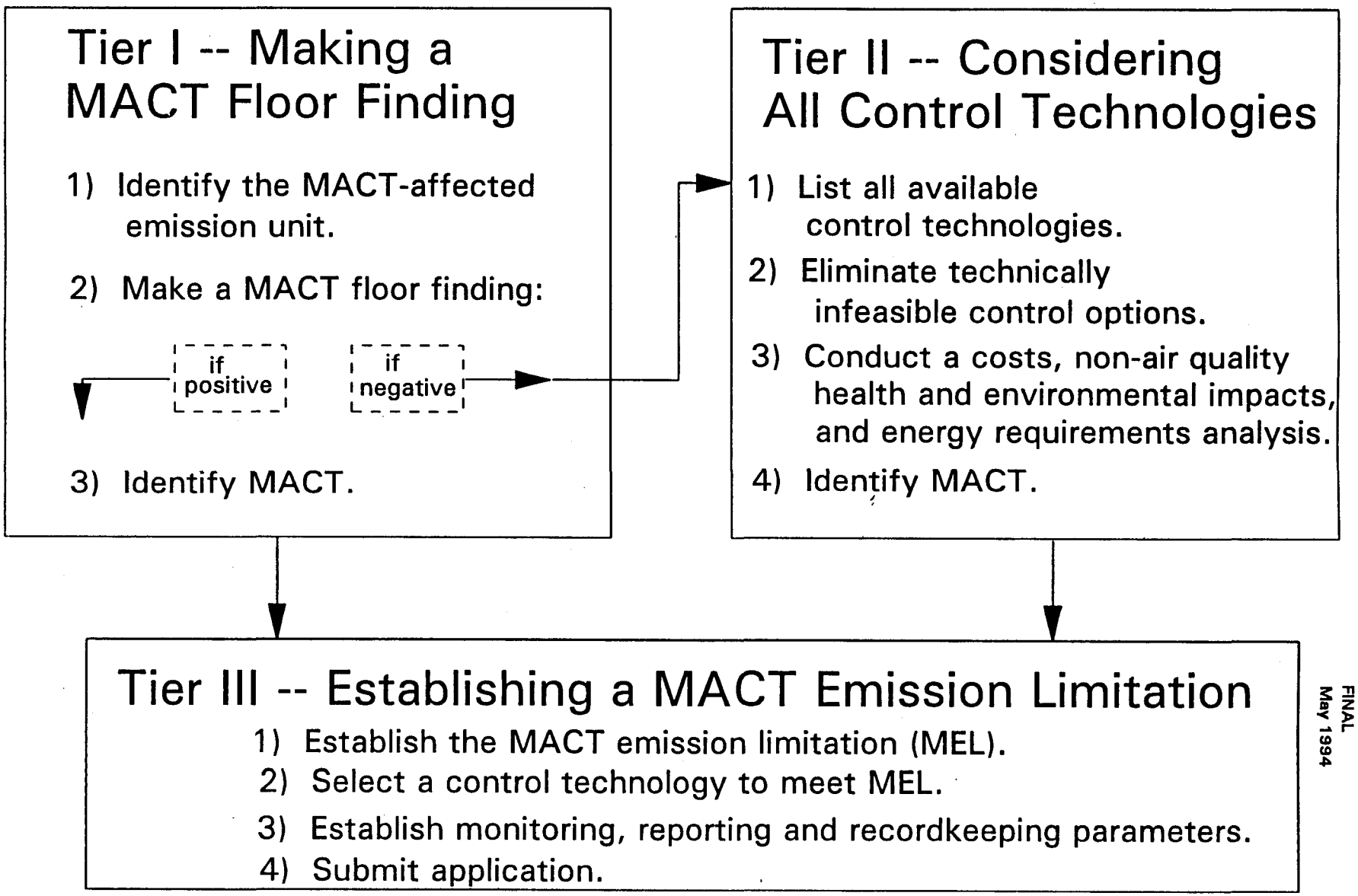
the requirements of 40 CFR Part 63, Subpart B.

3.1 Overview of the MACT Analysis Process

The MACT analysis uses available information to make a MACT floor finding. There are several possible situations that may arise in the course of conducting a MACT analysis. First, the MACT floor could also be determined based on emission reductions currently being achieved by other controlled emission units. This is known as a positive MACT floor finding. Other possible outcomes are that the MACT floor can not be determined, or that the MACT floor equals "no control". It may not be possible to calculate a MACT floor due to the nature of the pollutants emitted from the source, the lack of available data, or because there are less than five sources in the source category. A MACT floor could equal "no control" if a substantial number of sources within the category are not currently controlling HAP emissions. In either case, EPA believes that a more detailed analysis is required in order to determine the appropriate level of control. Therefore, a negative MACT floor finding is made.

Because of the variety of situations that could arise, the MACT analysis has been divided into three tiers. Figure 2 diagrams the steps for Tier I, Tier II and Tier III of the analysis. A MACT floor finding is made during Tier I. Tier II evaluates all commerically available and demonstrated controls that could be applied to the emission unit after a negative MACT

Figure 2 The MACT Analysis



floor finding is made. Tier III uses the information developed in Tier I or Tier II to establish a MACT emission limitation.

If a positive MACT floor finding is made, it is only necessary to complete Tier I and Tier III of the MACT analysis. This analysis compares the costs, non-air quality health and environmental impacts and energy requirements associated with using control technologies that obtain a level of HAP emission reductions that are equal to or greater than the MACT floor. If the MACT floor can not be determined or is equal to "no control" (a negative MACT floor finding), Tier II of the analysis should be completed.

The purpose of Tier II is to identify all commercially available and demonstrated control technologies using available information, including work practices, and pollution prevention methods that could reasonably be applied to the emission unit subject to the MACT determination. Available control technologies include but are not limited to: reducing the volume of, or eliminating emissions of pollutants through process changes, substitution of materials or other techniques; enclosing systems or processes to eliminate emissions; collecting, capturing, or treating pollutants when released from a process, stack, storage or fugitive emission point; using designs, equipment, work practices, or operational standards (including requirements for operator training or certification); or, a combination of any of these methods.

Once a list of available control technologies is developed, each control technology should be evaluated to consider the costs, non-air quality health and environment impacts, and energy requirements associated with using each control technology. The control technology(s) achieving the maximum degree of HAP emission reductions taking into consideration the costs of achieving such emission reductions and the non-air quality health and environmental impacts and energy requirements should be selected as MACT. Once MACT has been selected through either Tier I or Tier II of the analysis, the permitting agency should move to Tier III.

In Tier III, a MACT emission limitation(s) should be established based on the degree of emission reductions that can be achieved through the application of the maximum achievable control technology (MACT). A design, equipment, work practice or operational standard, or combination there of, should be designated as the MACT emission limitation, if it is infeasible, in the judgement of the permitting agency, to prescribe or enforce a numerical MACT emission limitation.

If an owner or operator wishes to comply with the MACT emission limitation using a control strategy other than MACT, then the Title V permit application should be submitted or revised to demonstrate that this alternative strategy achieves the required level of emission reductions.

3.2 A Detailed Look at the MACT Analysis

Tier I - Making a MACT floor finding

Step 1 -- Identify the MACT-affected emission unit(s)

In accordance with the provisions established in 40 CFR Part 63, Subpart B, the owner or operator is required to identify all HAP emission points within the source category. These "affected emission points" will be grouped into emission units (MACT-affected emission units). Each of these emission units will be subject to a MACT determination.

When a relevant emission standard has been proposed, the scope of the emission unit should be consistent with the existing source definition in the proposed emission standard, unless an alternative can be adequately supported. When no relevant emission standard has been proposed, the MACT-affected emission unit will be determined on a case-by-case basis. Section 3.3 of this chapter discusses principles for determining the MACT-affected emission unit on a case-by-case basis.

Step 2 -- Make a MACT floor finding

Using the available information provided by EPA, other permitting agencies, or the permit applications, a level of HAP emission control that is equal to the MACT floor for each type of emission unit undergoing review should be calculated. For new or reconstructed emission units, the MACT floor (or best controlled

similar source) should be determined using emissions information on similar emission units from within and outside of the source category. (Section 3.4 clarifies the term similar emission unit.) For existing emission units, the MACT floor should be calculated using only emissions information on other emission units within the source category.

Chapter 4 discusses three ways to establish a MACT floor: using (1) State and local regulations, (2) control efficiencies and (3) emission reduction ratios. Use of any of these methodologies to determine the floor depends on the format of available information. It is possible that a hybrid of these approaches may be necessary, or none of the methods may be appropriate given the format of the available information. These methods are provided in this guidance document to demonstrate the types of methodologies that would be appropriate for establishing a MACT floor.

If the MACT floor can not be determined or if it is equal to "no control", a negative MACT finding is made. Under these circumstances, Tier I should be discontinued and the permitting agency should move onto Tier II of the analysis.

Step 3 -- Identifying MACT

When a positive MACT floor finding is made, the permitting agency will need to identify control technologies that reduce HAP emissions from the MACT-affected emission unit to the maximum

extent and to a level that is at least equal to the MACT floor. For emission units requiring a new source level of control, consideration can be given to transfer and innovative technologies used to control emissions from other emission units that may not have met the definition of similar but nevertheless use technologies that can be applied to the MACT-affected emission unit.

The control technology that achieves the maximum degree of HAP emission reductions with consideration to costs, non-air quality health and environmental impacts, and energy requirements is MACT. The Act does not provide direction on the signficance of one consideration to another. EPA believes that it is inappropriate to provide specific guidance for determining the amount of consideration that should be given to any one factor. Such decisions will need to be made based on the information available at the time of the MACT determination. However, under no circumstances should the MACT emission limitation be less stringent than the MACT floor.

In general, a control option that reduces overall HAP emissions to the greatest extent should be identified as MACT; however, there may be occasions when the hazard to human health and the environment from a particular HAP warrants the selection of a MACT specifically for the control of that HAP. Identification of more than one control technology may be necessary when an emission unit has multiple HAP emissions.

After completing Tier I, the permitting agency should skip to Tier II of the analysis.

Tier II - Considering all control technology

Step 1 -- List available control technologies

Using available information, the permitting agency should develop a list of commercially available control technologies that have been successfully demonstrated in practice for similar emission units. Similar emission units are discussed in more detail in Section 3.4 of this chapter. In addition, the owner or operator may wish to consider innovative technologies and transfer technologies that might reasonably be applied to the MACT-affected emission unit.

Step 2 -- Eliminate technically infeasible control technologies

All control technologies that could not be applied to the MACT-affected emission unit because of technical infeasibility should be eliminated from the list. A technology is generally considered technically infeasible if there are structural, design, physical or operational constraints that prevent the application of the control technology to the emission unit. Cost to install and maintain the control technology is not considered a factor in determining technical feasibility.

Step 3 -- Conduct an impacts analysis

The permitting agency should conduct a detailed analysis on all of the available control technologies. The efficiency of each control technology in reducing overall HAP emissions should be determined. A reviewing agency may select MACT based on the degree of emission reductions achieved for one or more specific HAPs when the risk to human health and the environment warrants establishing MACT emission limitations specifically for these HAPs. Otherwise, MACT should be selected based on an overall reduction of all HAP emissions. It should be noted that the application of more than one control technology may be necessary in order to address multiple HAP emissions.

After determining the control efficiency of each available control technology, the control technology(s) that allows for a maximum degree of HAP emission reductions with consideration to the costs of achieving such emission reductions, and the non-air quality health and environmental impacts and energy requirements should be identified. This is the MACT. See Chapter 6 of this guidance document for a more detailed discussion on the analysis of the costs, non-air quality health and environmental impacts, and energy requirements.

Figure 1

Example Notice of MACT Approval

Notice of MACT Approval
CFR 40, Part 63, Subpart B
Maximum Achievable Control Technology Emission Limitation
for
Constructed and Reconstructed Sources
under Section 112(j)

This notice establishes federally enforceable maximum achievable control technology emission limitation(s) and requirements for Name of major source for the MACT-affected emission unit(s) located at location all MACT-affected emission units. The emission limitations and requirements set forth in this document are federally enforceable on effective date of notice.

A. Major source information

1. Mailing address of owner or operator:

2. Mailing address for location of major source:

3. Source category for major source:

4. MACT-affected emission unit(s): *List all emission unit(s) subject to this Notice of MACT Approval along with the source identification number if applicable.*

5. Type of construction or reconstruction: *Describe the action taken by the owner or operator of the major source that qualifies as the construction of a new source or reconstruction of an existing source under the requirements of 40 CFR Part 63, Subpart B, Sections 63.50-63.56*

6. Anticipated commencement date for construction or reconstruction:

7. Anticipated start-up date of construction or reconstruction:

8. List of the hazardous air pollutants potentially emitted by MACT-affected emission unit(s): *List all hazardous air pollutants that are or could possibly be emitted from the affected emission unit(s). Any pollutant not listed in this section can not be emitted by the emission unit without an amendment to the Notice of MACT Approval.*

B. MACT Emission limitation

1. The above stated owner or operator shall not exceed the following emission limitation(s) for the above stated MACT-affected emission unit(s). *Write in emission standard or MACT emission limitation for overall hazardous air pollutant emissions from each affected emission unit. If the permitting authority determines that an individual pollutant emission limitation is appropriate, it should also be listed in this section.*

2. The above stated owner or operator shall install and operate the following control technology(s), specific design equipment, work practice, operational standard, or combination thereof to meet the emission standard or MACT emission limitation listed in paragraph 1 of this section. *List all control technologies to be installed by the owner or operator and which emission units the control technologies will reduce HAP emissions from.*

3. The above stated owner or operator shall adhere to the following production or operational parameters for the technologies listed in paragraph 2 of this section. *State all production or operational parameters. For example:*

   The owner or operator may, subject to [name of agency] approval, by pass the emission control device for a limited period of time for purposes such as maintenance of the control device.

   The owner or operator shall operate and maintain the control equipment such that it has a 95% hazardous air pollutant destruction efficiency.

   The owner or operator shall not operate the MACT-affected emission unit for greater than 6 hours in any 24 hour period of time.

C. Monitoring requirements

For each MACT emission limitation and operational requirement established in Section B (MACT emission limitation) the above stated owner or operator shall comply with the following monitoring requirements. State all monitoring requirements. *For example:*

After installing the control equipment required to comply with Section(B)(1) visually inspect the internal floating roof, the primary seal, and the secondary seal, before filling the storage vessel

The owner or operator shall calibrate, maintain and operate a continuous monitoring system for the measurement of opacity of emissions discharged from the control device required in Section(B)(2) according to the following procedures:

D. Reporting and Recordkeeping Requirements

List all reporting and recordkeeping requirements in this section. *For example:*

The owner or operator shall maintain at the source for a period of at least 5 years records of the visual inspections, maintenance and repairs performed on each secondary hood system as required in Section(B)(2).

E. Other requirements

1. The above stated owner or operator shall comply with all applicable requirements specified in the general provisions set forth in Subpart A of 40 CFR Part 63, including but not limited to notification operation and maintenance, performance testing, monitoring, reporting, and recordkeeping requirements. *If there are any specific requirements that the reviewing agency would like to clarify, those requirements should also be stated in this paragraph. This paragraph could also include requirements for emergency provisions and start-up and shut-down procedures.*

2. In addition to the requirements stated in paragraph 1 of this section, the owner or operator will be subject to these additional requirements. *Any additional requirements not specified in Subpart A of 40 CFR Part 63 should be stated in this paragraph. If the*

reviewing agency wishes to require a mandatory retest of a failed performance test that should be stated in this paragraph, along with any other requirements specified by the reviewing agency.

F. Compliance Certifications

The above stated owner or operator shall certify compliance with the terms and conditions of this notice according to the following procedures: *This sections should include a description of the terms and condition that the owner or operator will use to certify compliance, as well as, the format and frequency of the certification.*

Chapter 2.0

The MACT Determination

2.1 Criteria for the MACT Determination

The process of determining an equivalent (MACT) emission limitation is called a MACT determination. For MACT determinations under Section 112(j), the MACT emission limitation should be comparable to the emission limitation(s) or requirements that would likely be imposed if a Section 112(d) or Section 112(h) emission standard had been promulgated for that source category. The Clean Air Act sets forth specific criteria for setting a hazardous air pollutant emission standard under Section 112(d) and Section 112(h). These criteria should also be used when establishing the MACT emission limitation under Section 112(j).

Permits conditions created through Section 112(j) of the Act should require emission reduction that:

1) Are no less stringent than the MACT floor when a MACT floor can be determined; and,
2) Achieves a maximum degree of HAP emission reduction with consideration to the cost of achieving such emission reductions, and the non-air-quality health and environmental impacts, and energy requirements; and,
3) Limits the quantity, rate or concentration or HAP

emissions on a continuous basis; or,

3) Designates a specific design, equipment, work practice, operational standard, or a combination thereof, that achieves a maximum degree of emission reduction, when it is infeasible to prescribe a specific numerical emission limitation.

The MACT emission limitation could be expressed as a numerical emission limitation on the total quantity of HAP emissions from the source in tons per year (tpy), a production ratio (e.g. 10 lbs of HAP/100 lbs of polymer), or as a concentration limit (e.g. 10ppm/w HAP). The MACT emission limitation could also be a performance standard based on the expected efficiency of MACT in reducing HAP emissions. For example, a source may be required to reduce emissions by 90% from a 1990 baseline. If it is infeasible to prescribe a specific numerical limitation or reduction efficiency the MACT emission limitation can also be expressed based on a design, equipment, work practice, operational standard, or any combination of these. For example, a permit may require a source to use a high efficieny spray gun in the coating process.

If an individual hazardous air pollutant is of particular concern, a MACT limitation should also be placed on that pollutant based on the expected level of reduction with MACT in place. Reviewing agencies should consider whether it is appropriate to impose such a limitation on a specific hazardous

Tier III -- Establishing a MACT emission limitation

Step 1 -- Establish a MACT emission limitation (MEL)

The MACT emission limitation is based on the degree of emission reduction that can be obtained from the MACT-affected emission unit, if MACT is applied, and properly operated and maintained. The MACT emission limitation should be based on an overall reduction of all HAP emissions; however, if possible, the efficiency of the MACT in reducing each potential HAP emission should also be stated. The permitting agency may establish a MACT emission limitation for an individual HAP when the risk to human health and the environment warrants such an emission limitation, or when such a limitation is necessary to make the overall HAP emission limitation federally enforceable. If it is not feasible to establish a specific numerical or efficiency limitation, then a specific design, process, or control technology should be designated as the MACT emission limitation. Chapter 5 of this manual explains several procedures for calculating the MACT emission limitation.

Step 2 -- Select a control technology to meet the MACT emission limitation

Once the permitting agency determines the MACT emission limitation, the applicant should be given the opportunity to

propose a control strategy that allows the emission unit to obtain the required emission reductions. In many cases, this will be through the application of the MACT technology. However, in some cases, the emission unit at the major source may already be controlled to a some extent with an existing control technology. The owner or operator could demonstrate that using additional control strategies in combination with existing controls will allow the emission unit to achieve the required emission reductions. For instance, an emission unit may currently be controlled with a baghouse. The MACT emission limitation for the emission unit may be based on use of an electric static precipitator. The emission unit may be able to meet the MACT emission limitation by installing a series of baghouses in lieu of the electric static precipitator. Chapter 5 of this manual discusses how the amount of additional control that would be required (ARC) can be computed under such circumstances.

Owners or operators are reminded that the application of a case-by-case MACT to an emission unit does not exempt that owner or operator from complying with any future emission standards affecting that emission unit. The MACT floor emission limitation as calculated on a case-by-case basis should be considered only a relative indicator of the future MACT emission standard. Changes in technology or application of controls to under-controlled sources may shift the MACT floor to a higher control level,

additional emissions information may be available that generates a different level of control for the MACT floor, or a control technology that is more effective in controlling HAP emissions may be selected based on the relative cost of applying that technology on a nationwide basis. Owners or operators may wish to consider these factors when selecting a control technology to meet the MACT emission limitation.

Step 3 -- Establish appropriate monitoring, reporting and recordkeeping parameters

The permitting agency should identify monitoring parameters to assure compliance with the MACT emission limitation. Section 2.2 of Chapter 2 discusses compliance provisions in greater detail.

3.3 Determining the MACT-affected Emission Unit

The purpose of a case-by-case MACT determination is to determine that all affected emission points will meet a MACT emission limitation. A MACT emission limitation will be established for an emission unit known as the MACT-affected emission unit. The MACT-affected emission unit could either be a single affected emission point, or a combination of affected emission points.

There are four basic principles to follow when designating the MACT-affected emission unit. The principles can be summarized as follows: 1) When a relevant Section 112(d) or Section 112(h) standard has been proposed, the permitting agency should refer to the relevant standard to determine the MACT-affected emission unit; or, (2) The EPA's Office of Air Quality Planning and Standard's should be consulted to determine if a suggested method for grouping affected emission points is available ; or, (3) When a specific piece of equipment is designated as a source category on the source category list, the MACT-affected emission unit is that piece of equipment or apparatus; or, (4) Emission points should be combined into a single MACT-affected emission unit when the combination of points leads to a much more cost-effective method of control, and achieves a greater degree of emission reductions when compared to point-by-point compliance.

The best indicator of how a source category may be regulated

after the promulgation of a relevant standard is found in a proposed standard. For this reason, EPA believes that permitting agencies should follow the guidelines in the proposed standard to determine the MACT-affected emission unit for a Section 112(j) MACT determination. In addition, although there may be no proposed standard for the source category, and EPA may have missed the promulgation deadline for that source category, information on the source category may have been collected which allows EPA to recommend a specific method for determining the emission unit for a Section 112(j) MACT determination. Therefore, EPA should be consulted before attempts are made to define the MACT-affected emission unit on a case-by-case basis. EPA can be contacted through the Control Technology Center Hotline operated by the Office of Air Quality Planning and Standards at (919)-541-0800.

When an affected emission point(s) is associated with a piece of equipment or apparatus specifically listed on the source category list, that affected emission point(s) is the MACT-affected emission unit. The source category list (See Appendix D) contains sources that are defined by a manufacturing or process operation, or as an individual piece of equipment. In developing the source category list, EPA determined that some individual pieces of equipment have the potential to emit major amounts. For example, under the fuel combustion industrial grouping, stationary internal combustion engines are listed as a

source category of major sources. When a source category is designated by a single type of apparatus, the EPA believes that the intent is for emission limitations and requirements to be placed on that specific piece of equipment. As such, if a Section 112(j) determination is conducted for any one of these source categories, the specific piece of equipment or apparatus should be designated as the MACT-affected emission unit. Other examples of apparatus that are listed as a source category or major sources are municipal waste incinerators, process heaters, and stationary turbines. The owner or operator should review the list found in Appendix D to determine other source categories that could be defined as the MACT-affected emission unit.

Otherwise, individual affected emission point can be considered a MACT-affected emission unit, or a group of affected emission points can be combined into one affected emission unit. There are several ways in which emission points could be combined to form an emission unit. A few points could be combined, an entire process unit could be included in the MACT-affected source, or the MACT-affected source could be as large as the source category boundary.

For example, a single emission point such as a storage tank could be consider the MACT-affected emission unit. Or, emission points from a distillation column, a condenser and distillate receiver could be consolidated into one emission unit. Larger groupings of emission points may be appropriate when a single

control technology can be used to control the aggregation or when a pollution prevention or waste reduction strategy is considered. For instance, the entire wastewater treatment operation could be considered one emission unit. Collectively, a single steam-stripper could be used at the beginning of the operation to remove HAPs from the wastewater and prevent downstream emissions from occurring. Another example is illustrated with a surface coating operation. Rather than individually controlling the emissions from a spray booth, flash-off area, and bake oven, switching to a water-based paint could reduce emissions from all of these emission points.

Another reason to combine affected emission points into a single emission unit is that many major sources are already subject to regulation under 40 CFR Part 60 and Part 61. In promulgating these standards, "affected facility" definitions were developed to designate the apparatus to which a standard applies. It may make sense to use these same boundaries to designate the "MACT-affected emission unit" subject to a MACT determination. It should be noted that a particular piece of apparatus or equipment should not be excluded from a MACT determination because of an applicability "cut-off" established under a Part 60 or Part 61 regulation.

Emission points could be consolidated into an emission unit that is as large as the source category boundary for several reasons. First, the MACT floor needs to be calculated

specifically for the MACT-affected emission unit. The information that is available to calculate the MACT floor may only be available for the source category as a whole, not individual points within the category. Also, the operations of some source categories are quite variable. Either the nature of the process requires a large latitude of flexibility in establishing the emission unit that should be controlled, or the types of facilities within the category are so diverse that it only makes sense to compare the existing sources on a source category wide level. In these instances, a source category wide MACT-affected emission unit could allow some emission points to be under-controlled while others are controlled to a level that would exceed the level of control that would be placed on that individual point through the application of MACT. Permitting agencies are cautioned that it would be generally inappropriate to include emission points associated with equipment leak emissions into such a MACT-affected emission unit.

There are some situations which would not make the combination of emission points reasonable. First, the combined emission unit can not generate an emission unit that is so unique that it precludes comparing the emission unit to other sources in the source category. Second, the combining of emission points should reduce emissions from all of the affected emission points within the MACT-affected emission unit through use of a control technology that affects all of those emission point, or involves

recycling or reuse, or constitutes an overall source reduction strategy as defined in the Pollution Prevention Act, P.L. 101-503. The types of activities that would be considered pollution prevention or source reduction measures include changes in technology, process or procedures, reformulation or redesign of products, and substitution of raw materials. A decrease in production rate alone would not constitute a source reduction strategy unless the rate reduction was associated with a pollution prevention measure such as increasing efficiency of the operation.

Determining the MACT-affected emission unit on a case-by-case basis is a complex undertaken. While this document includes this step as a separate component of the Tier I approach, in actual practice the identification of methods to control specific groups of emission units and the identification of control technology options will be integrated processes. Some aggregations of emission points may be inappropriate because the information available to calculate the MACT floor would dictate combining emission points into certain emission units, or because controls applied to the unit would not achieve a MACT level of control when compared to point-by-point compliance or some other combination of emission units. Appendix A provides an example of ways in which available control technologies would affect the aggregation of emission points into an emission unit.

3.4 Similar Emission Units

There are at least two occassions in which a permitting agency should evaluate control technologies used by emission units in other source categories: (1) When a negative MACT floor finding is made during Tier I of the MACT analysis; and, (2) When an applicant is constructing or reconstructing an emission unit. Whether control technologies from other sources categories should be considered in the MACT analysis depends on whether the emission unit is "similar". Two questions should be answered to determine if an emission unit is similar: 1) Do the two emission units have similar emission types, and 2) Can the emission units be controlled with the same type of control technology. If the two emission units do have similar emission types and are controllable with the same control technologies, then the two emission units are considered similar for the purposes of a case-by-case MACT determination under Section 112(j).

The EPA developed an emission classification system to be used for determining emission types for case-by-case MACT determination. The five emission classifications are as follows:

Process vent or stack discharges - the direct or indirect discharge of an organic liquid, gas, fume, or particulate by mechanical or process-related means. Examples would be emission discharges from columns and receiving tanks from distillation, fractionation, thin-film evaporation, solvent

extraction, air and steam stripping operations, absorbers, condensers, incinerators, flares, and closed-looped biological treatment units.

Equipment leaks - fugitive emissions from the following types of equipment: valves, pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves and lines, flanges, agitators, sampling connection systems, and valve connectors.

Evaporation, breathing and working losses - emissions from storage or accumulation of product or waste material; for example: stationary and mobile tanks, containers, landfills, and surface impoundments, and pilings of material or waste.

Transfer losses - emission of an organic liquid, gas, fume, vapor or particulate resulting from the agitation of material during transfer of the material from one unit to another. Examples of such activities are filling of mobile tanks, dumping of coke into coke quench cars, transfer of coal from bunker into larry car, emptying of baghouse hoppers, and sludge transfer.

Operational losses - emissions resulting from the process operation which would result in fugitive emissions if

uncontrolled by hoods or vacuum vent, or other vent systems. Examples of operation loses are emission resulting from spray coating booths, dip-coating tanks, quenching towers, lubricating stations, flash-off areas, or grinding and crushing operations.

The classification scheme should serve as a general guide in identifying available control options. When using the list of classifications, consideration should be given to the concentration and the type of constituents of a gas stream. While two pieces of apparatus are classified within the same emission type, this does not automatically mean that the emission points can be controlled using the same type of control technology. For instance, storage tanks and landfills are both listed in the evaporation and breathing losses classification, but it is unlikely that a storage tank and landfill would be controlled with the same technology. In order for an emission unit to be considered similar it must fit both criteria: have a similar emission type and be controllable with the same technology.

For example, suppose Section 112(j) applies to the captan production source category (a source listed on the source category list in Appendix D,) and a major source within this category proposes to add additional product accumulation vessels (tanks) and additional pipes, pumps, flanges and valves to direct

the product to the tanks. The permitting agency determines that the pipes, etc. are part of an existing source, but each new tank qualifies as a new source. During Tier I of the MACT analysis, it is determined that there are no regulations controlling HAP emissions from pumps, etc within the source category. There is also not enough emission information available on other emission units within the source category to calculate a MACT floor. During Tier II of the analysis, it is discovered that the Synthetic Organic Chemical Manufacturing Industry (SOCMI) source category is currently subject to regulations controlling equipment leaks. Because the pipes, pumps, and flanges all have equipment leak emissions, the emission units in the SOCMI source category would be considered similar emission units. The regulations for SOCMI equipment leaks should be considered for the control of the MACT-affected emission unit during Tier II of the analysis. When determining the existing source level of control, identification of a similar emission unit does not mean that the controls will automatically be applied to the MACT-affected emission unit. Costs, non-air quality health and environmental impacts, and energy requirements should be used to assess the technologies ability to meet MACT criteria.

Also during Tier I of the analysis, it is determined that the best controlled tank within this source category does not have state-of-the-art controls. Yet, tanks from outside the source category storing similar organic liquids use state-of-the-

art controls vented to an emission control device. Such tanks are clearly "similar". The controls used on these tanks would be considered to establish the best controlled similar source.

It is not always appropriate to consider all transferrable technologies when determining the best controlled similar source. It would be inappropriate to consider a transfer technology when the emission units have different emission types. For example, within source category X, spray booths tend to be uncontrolled due to gas streams with low concentrations and relatively high airflows. Source category Y uses incineration to control emissions from spray boothes with high concentrations and low airflow volumes. The emissions from these sources are clearly not similar, and controls for category Y would not be used to determine the best controlled similar source for category X. However, if it is technologically feasible to apply the controls, these same controls could be considered to establish a new source level of control beyond the best controlled similar source, if consideration is given to cost, non-air quality health and environmental impacts, and energy requirements.

3.5 Subcategorization

When the source category list was developed, sources with some common features were grouped together to form a "category". During the standard-setting process, EPA may find it appropriate to combine several categories or further divide a category to distinguish among classes, types, and sizes of sources. EPA chose to establish broad source categories at the time the source category list was developed because there was too little information to anticipate specific groupings of similar sources that are appropriate for defining MACT floors for the purpose of establishing emission standards.

The broad nature of some source category descriptions may pose some difficulty in establishing an appropriate MACT emission limitation for a MACT-affected emission unit on a case-by-case basis. Subcategorization within a source category for the purposes of a case-by-case MACT determination should be considered only when there is enough evidence to clearly demonstrate that there are air pollution control engineering differences. Criteria to consider include process operations (including differences between batch and continuous operations), emissions characteristics, control device applicability and costs, safety, and opportunities for pollution prevention.

Chapter 4.0

The MACT Floor Finding

During Tier I of the MACT analysis, the permitting agency is required to make a positive or negative MACT floor finding. A positive finding would be made if there is enough information to determine an emission control level that is at least equal to the MACT floor. A negative MACT floor finding would be made if: (1) the MACT floor equals "no control"; (2) a MACT floor can not be determined due to the nature of the pollutant or process; or, (3) there is not enough emissions information to compute a MACT floor.

The Act specifically directs EPA to consider the "average emission limitation" to establish the MACT floor for existing sources (emission units). Section 4.1 of this chapter discusses the calculation procedure for determining an "average emission limitation". This procedure establishes a hierarchical system for determining the average emission limitation using the arithmetic mean, median or mode.

Using the calculation procedures discussed in Section 4.1, this chapter explains three acceptable methods for determining a MACT floor. If the emissions information is available, all three methods should be considered before the permitting agency concludes that a MACT floor can not be found. The three methods include using: (1) existing State and local air toxic control regulations; (2) control efficiency ratings; or (3) emission

reduction ratios.

The first method compares air pollution regulations in different States. The second method is applicable only when the control technologies under consideration can be assigned an efficiency rating for HAP emission reductions. This is most-likely to occur with add-on control devises. The third method can be used for add-on control devises, work practices, recycling, reuse or pollution prevention strategies. Depending on the format of available information, a hybrid of the three approaches may be necessary. Later in this chapter each of these methods is discussed in greater detail.

4.1 Calculation of the MACT Floor

Section 112(d) of the Act instructs EPA to set emission standards for new sources based on the emissions control achieved in practice by the best controlled similar source and to set emission standards for existing sources based on an average emission limitation achieved by the best performing 12% of existing sources or best performing five sources in the source category. For new sources the direction provided by the Act is relatively clear. For existing sources, further clarification is required by EPA to determine how an average emission limitation should be computed.

The word average can have several different meanings, including arithmetic mean, median and mode. EPA has developed the following hierarchy for determining the average emission limitation that is equal to the MACT floor. First, if the emissions data that is to be used to calculate the floor is in the form of a numerical expression, (i.e. 95% reduction), the MACT floor should be determined by taking the arithmetic mean of the best performing 12% of existing sources or the best performing five sources. An arithmetic mean is calculated by summing all of the data and dividing by the number of data elements in the calculation. The following example illustrates this concept:

Example 1

The following emission limitations are representative of the best performing 12% of existing source:

% reduction	
99	Average emission limitation =
99	
95	656/7 = 93.7%
93	
92	
89	
89	
Total 656	

# of sources = 7

Under some circumstances the arithmetic mean results in a number that may not correspond to the application of a specific control technology. For instance suppose the arithmetic mean of emission limitations of the best performing 12% of exist sources is equal to 92.3%. Application of control technology X would provide a source 91% control, while application of technology Z would limit the source's emissions by 96%. In most cases, when the arithmetic mean can not be specifically achieved by the application of a control technology, the MACT floor should be elevated to the level of control associated with the control technology that exceeds the MACT floor. In Example 1, the MACT emission limitation should be no less stringent than 95% control. This concept would not make sense if there is a large discrepancy between the amount of emission reductions that can be achieved by

available control options. This is illustrated with the following example:

Example 2

An arithmetic mean is computed for the best performing 12% of storage tanks. There are 10 sources among the best performing 12% of storage tanks. Two tanks are controlled by 99%, the remaining 8 tanks are not controlled. The emissions limitations considered in the floor calculation are:

% reduction	
99	
99	average emission limitation =
0	
0	19.8% reduction
0	
0	
0	
0	
0	
0	
Total 198	

# of sources = 10

In this example, no technology corresponds to 19.8% control, and it might be inappropriate to elevate the MACT floor to 99% control.

If there is a large discrepancy between the amount of emission reductions that can be achieved by available control options, the median should be used in lieu of the arithmetic mean

to determine the average emission limitation equal to the MACT floor. A median is the value that falls in the middle of a set of numbers when those numbers are arranged in an increasing order of magnitude; in other words, there will be an equal number of values above and below the median. If the middle falls between two values, the median is equal to the arithmetic mean of those two numbers. This situation will occur when there is an even number of values in the set of numbers. When computing the average emission limitation for the best performing 12% of existing sources, the MACT floor will likely be equal to the lowest emission limitation achieved by the best 6% of sources in the source category. For example:

Example 3

There are 84 sources in the source category. The number of sources in the best performing 12% of sources is equal to 10. The median is to be computed for the following emissions data:

% reduction	
24	
26	There are a total of 10 numbers.
30	The median would be the arithmetic
30	mean of the 5th and 6th numbers
33	in the column.
40	
56	median = (33 + 40)/2 = 36.5
88	
93	
99	

Like the computation of the arithmetic mean, the value obtained for the median may not always correspond to a specific control technology. If there is a control technology that obtains slightly greater emission reduction than the median, the MACT floor should be based on that control technology. For instances, in Example 3, the MACT floor would be equal to 40% emission reductions. This value coincides with the lowest emission limitation achieved by the best performing 6% of sources. However, if there is a large discrepancy between the control technologies used to establish a median such that no technology could realistic obtain a reduction close to the median, the mode should be used to calculate the MACT floor.

A mode is the most frequent occurrence among a set of data. In Example 1, there are two modes, 99% and 89% emission reductions. In Example 2, the mode would be equal to 0% emission reductions; and the mode in Example 3 would be 30. When there is more than one mode in the data set, the MACT floor should be based on the least degree of emission control. However, existence of more than one mode may be an indicator that the MACT floor should be established at a level of control more stringent than the MACT floor.

The mode may also be used as a method to compute an average emission limitation if the emissions data for a source category is not based on a numerical number. This could occur if sources were regulated by several different equipment or work practice

standards. Unless a specific level of emission reduction can be associated with each different standard or unless the standards can be ranked in some order of increasing level of control, an arithmetic mean and median can not be calculated. A mode could be used if one of the control options is used more frequently by one of the best performing 12% of existing sources. For example:

Example 4

There are 44 tanks in the source category. Five sources are among the best performing 12% of existing sources. These five tanks are subject to the following regulations in the source category:

3 of the 5 must be covered and vented to a carbon canister;

2 of the 5 must use a fixed roof

The mode would be to cover and vent the tank to a carbon canister.

The following sections of this chapter detail the three acceptable methods for computing a MACT floor. **It should be noted that when the best controlled similar source is being determined for new sources, all references to using emissions information from within the source category should be ignored.** A determination of the best controlled similar source should not be limited to within the source category. Readers are referred to

Section 3.4 of this chapter for a definition of similar emission unit.

4.2 Method 1 - Computing the MACT Floor Using Existing State and Local Regulations

The steps for computing a MACT floor using this method are listed in Figure 3. The following describes these steps.

Step (A) Conduct a geographical survey

Determine the number of existing similar emission units in the source category, and conduct a survey to determine the geographical location of these similar emission units. Group the emission units according to the state or locality in which they are located.

Step (B) Review State or local air pollution regulations

Review the different State or local air pollution control regulations that are applicable to the emission unit in each State or locality where an emission unit is located.

Step (C) Rank the State or local air pollution regulations

For the State and local regulations identified in Step B, rank the regulations in order of stringency. The regulations that require the greatest level of control should be listed first.

Figure 3

Using State or Local Air Pollution Regulations to Compute the MACT Floor

Step A Conduct a Geographical Survey

Step B Review State and Local Air Pollution Regulations

Step C Rank the Regulations according to Stringency

Step D Determine the Percentage of Emission Units Complying with each Stringency Level

Step E Determine MACT Floor

Step (D) Determine the number of emission units regulated by each stringency level.

For each level of stringency identified in Step (C), a percentage of emission units required to comply with the regulations should be computed.

Step (E) Make a MACT floor finding

For constructing or reconstructing major sources, the MACT floor equals the most stringent State or local regulation applying to a similar emission unit. For a modified major source, the MACT floor is either equal to the arithmetic mean of the best 12% of existing emission units in the source category, or the best 5 existing emission units in the source category. If the arithmetic mean can not be calculated, the median or mode should be used to compute the MACT floor for existing sources.

Figure 4 illustrates the following example of this concept: In Step (A), the owner or operator determines that there are 42 similar emission units in the MACT-affected emission unit's source category. Sixteen of the sources are located in State A, five in State B, three in State C, and 18 in State D. A specific numerical value can not be determined for all of these regulations, but it is possible to list the regulations in order of stringency. Upon reviewing the regulations in these four States, it is determined that States A and B have the most

Figure 4

Evaluation of State Regulations for Emission Unit X

STATE	STRINGENCY*	# OF SOURCES
A	1	16
B	1	5
C	2	3
D	3	18
TOTAL	____	42

Total # of emission units = 42

# of emission units within the top 6% of existing emission units = 3 (42 * 0.06)

Stringency level top 6 emission units must comply with = 1

MACT floor = regulations in State A or B

* Stringency is rated from the most stringent State regulation beginning at 1 and increasing in number as the regulation is rated less stringent.

stringent regulations for this source; and, they are equally stringent. These State regulations are followed in stringency by State C. State D is the least stringent state; there are no regulations and the sources are uncontrolled.

State A and B regulate 50% of the sources. Using the median to compute the MACT floor, the MACT floor would be equal to the least stringent regulations governing the most strictly regulated 3 sources (42 * 0.06 rounded to the next largest whole number.) In this case, the MACT floor would be equal to either State A or State B's regulations.

4.3 Method 2 -- Computing the MACT Floor using Control Efficiency Ratings

To use this method to calculated the MACT floor, the owner or operator will evaluate emission units that use add-on control devices or other methods whose HAP control efficiencies have been clearly demonstrated. The MACT floor and MACT emission limitation can be computed as follows:

Step (A) Determine HAP emission reduction efficiency for each control device.

For each emission unit in the source category, the ability of each control technology to reduce HAP emissions should be determined as a percentage of reduction efficiency. For constructing and reconstructing emission units, the reduction efficiency should be computed for all similar emission units. Acceptable methods for determining the efficiency rating are:

1) Equipment vendor emission data and guarantees;
2) Federal and State enforceable permits limits on operation of the control technology;
3) Actual reported efficiency from the similar emission unit.

Step (B) Calculate the MACT floor

For new and reconstructing emission units, the MACT floor equals the level of emission reductions that can be obtained by

the control technology with the highest emission control rating. For existing emission units, the MACT floor equals the arithmetic mean of the best five or the best performing 12% of control efficiency ratings. Or, if the median is used the MACT floor equals the lowest control efficiency rating achieved by the best 6% of sources if there are greater than 30 sources in the source category; or, the MACT floor equals the lowest control efficiency rating among the best 3 sources if there are less than 30 sources in the source category. Under most circumstances, it should not be necessary to use the mode to compute an average emission limitation; however, if it is used, the MACT floor would be equal to the most frequent control efficiency rating among the best performing 12% of existing sources or the best performing five sources.

4.4 Method 3 - Computing the MACT floor Using Emissions Reduction Ratios (ERR)

The emission reduction ratio is a fraction of uncontrolled emissions to controlled emissions. The MACT floor is computed using the emission reduction ratios. To compute the emission reduction ratio for each emission unit, the owner or operator must review emissions data or other information to determine uncontrolled and controlled emissions levels for these units. The step-by-step process is detailed below and summarized in Figure 5.

Step (A) Compute an uncontrolled emission level (UCEL) for each emission unit

The UCEL for an emission unit is the maximum amount of HAP that could be emitted from the emission unit using current design specifications at full capacity utilization in the absence of controls. For existing emission units, this calculation could be done for each emission unit in the source category, and for new and reconstructed emission units for each similar source. However, in some circumstances, there may not be enough information to compute a specific UCEL for each emission unit. In such cases, it would be appropriate to develop one UCEL that would be representative of all emission units in the source category. Readers should review Chapter 5 for further explanation on calculating the UCEL.

Figure 5

Using Emission Reduction Ratios to Compute the MACT Floor

Step A — Compute an Uncontrolled Emission Level (UCEL) for each emission unit.

Step B — Compute a Controlled Emission Level (CEL) for each emission unit.

Step C — Compute an Emission Reduction Ratio (ERR) for each emission unit.

$$ERR = \frac{UCEL - CEL}{UCEL}$$

Step D — Determine the MACT Floor.

Step (B) Compute a controlled emission level (CEL) for each emission unit

The CEL is the maximum amount of HAP that could be emitted from the emission unit under the major source's current design specification and at at full capacity utilization taking into consideration the application of federally enforceable controls. Ideally, A CEL should be computed for all emission units, even when a single UCEL is used. However, if only general information is known about the types of control technologies that are being used in practice, a CEL could be estimated for each control scenario. Then a CEL for each emission unit would be assigned based on the types of controls that major sources uses. Readers should review Chapter 5 for more information on CEL.

Step (C) Compute the emission reduction ratio (ERR) for each emission unit:

The ERR for each emission unit can be computed using the following formula:

$$ERR = \frac{UCEL - CEL}{UCEL}$$

Step (D) Determine the MACT floor.

For new and reconstructing emission units the MACT floor would be equivalent to the highest ERR. For existing sources,

the MACT floor equals the arithmetic mean of the best five or best 12% of ERRs. If the median is used, the MACT floor equals the lowest ERR among the best 6% of ERRs or the best three ERRs depending on the number of sources in the source category. If the mode is used, the MACT floor equals the most frequently occurring ERR among the best performing 12% of sources or best 5 sources depending on the number of sources in the source category.

For example, suppose a major source determined that there are four emission units in the top 12% of existing emission units for the source category. These four emission units had emission reduction ratios of 0.90, 0.92, 0.93, and 0.99. The control technologies used by these best performing 12% of similar source are a wet scrubber, a solvent change, a condenser, and an incinerator. The arithmetic mean for these values equals 0.935. If this value does not correspond to the application of a specific control technology, the MACT floor would be equal to an emission reduction ratio of 0.99. If it is determined that elevation of the MACT floor to this level is infeasible, then the median should be computed for these sources. The median would be equal to best performing 6% of sources or the lowest of the highest two emission reduction ratios. This is equal to 0.93.

4.5 Other Methods to Compute the MACT Floor

As future MACT standards are proposed or promulgated for different source categories, more methods for determining the MACT floor could be developed. The reader is referred to the Federal Register to locate any other methods for calculating the MACT floor that have been approved by the EPA and used in developing a MACT standard under Section 112(d) or 112(h) of the Act.

Chapter 5

The MACT Emission Limitation

As previous chapters discuss, the MACT emission limitation (MEL) is based on the degree of emission reductions that can be obtained when MACT is applied and properly operated. Determining the expected efficiency of an add-on control may required some engineering judgement. In some instances, the add-on control may achieve different levels of reduction efficiency even when it is applied to the same type of emission unit. Lower efficiency ratings may be due to different operational parameters or poor maintenance practices. Other variations may be unexplainable. The MEL should be based on the degree of efficiency that the control technology is likely to obtain for all emission units under good operational and maintenance practices.

Chapter 4 of this manual describes three possible methodologies for calculating a MACT floor. It is likely that the regulatory format of the MACT emission limitation will be similar to the format of the MACT floor. For instance, if the MACT floor is computed to be a limit of 0.30 lbs/ton of feed, the regulatory format of the MACT emission limitation is also likely to be expressed as lbs/ton of feed. The following sections provide guidance on calculating the MACT emission limitation for a source category. It also discusses how a permitting agency can determine what amount of control an individual major source needs

to achieve the required reductions.

5.1 Using control efficiencies to establish the MACT emission limitation

When control efficiencies are used to establish a MACT floor, the MACT emission limitation (MEL) could be expressed as this efficiency. In other words all sources could be required to reduce by some percent (i.e. 90% reduction). Additional terms and conditions would be necessary to make this federally enforceable, but such an emission limitation may be appropriate when the manner in which the emission unit is operated is relatively homogenous within the source category. For other source category it may be appropriate to convert this efficiency rating into another format. This can be accomplished by multiplying the efficiency of MACT by the uncontrolled emission level (UCEL) of the emission unit as follows:

$$MEL = UCEL * MACT\ efficiency$$

The UCEL for an emission unit is the maximum amount of HAP that could be emitted from the emission unit using current design specifications at full capacity utilization in the absense of controls. It could be computed using a variety of different formats, i.e. tons/yr, lbs/hr, tons/product, etc.. Acceptable

methods for computing the UCEL are:

(a) Engineering calculation using material balance or emission factors;

(b) Actual emission data from the similar emission unit;

(c) Average annual hourly emission rate multiplied by hours of operation;

(d) Emission limits and test data from EPA documents, including background information documents;

(e) Equipment vendor emission data and guarantees;

(f) State emission inventory questionnaires for comparable sources;

(g) Federal or State enforceable permit limits; or,

(h) For equipment leaks use, "Protocols for Equipment Leak Emission Estimates," EPA-453/R-93-026.

The UCEL for the emission unit should be representative of the typical amount of emissions that would occur from an emission unit in the source category in the absence of controls. This will likely require some engineering judgement on the part of the permitting agency. Typical throughputs, flow rates, concentrations, etc. should be used to estimate a UCEL that can be applied to the source category.

Permitting agencies are reminded that the definition of a control technology includes the use of pollution prevention and source reduction strategies. The permitting agency should take

into consideration the use of such control measures when computing the UCEL for an emission unit. For example, suppose that some major sources in the source category use a high VOC solvent as a process input to the emission unit. Other sources use a lower VOC solvent as a process input to the same type of emission unit. No distinction in the type of process inputs have been made in designating the emission unit. MACT for this emission unit is identified as control technology X. This control technology has been determined to have a control efficiency rating of 90%. Using the current design specifications for each emission unit in the category would require all sources to reduce emissions by 90%, but would not account for the different baseline emissions from different emission units in the source category. By calculating the UCEL for all emission units in the category based on the high VOC process input, emission units with inherently lower potentials to emit can take credit for the emission reduction in the controlled emissions calculation and the calculation of additional required control.

5.2 Using an emissions reduction ratio (ERR) to compute the MEL

When an emission reduction ratio (ERR) is used to determine the MACT floor, the MACT emission limitation can be computed by multiplying the uncontrolled emission level (UCEL) of the emission unit by the emission reduction ratio (ERR) of MACT using the following formula:

$$MEL = UCEL * (1 - MACT_{ERR})$$

5.3 Additional control requirements

As previously explained in Section 3.2, a major source is not required to install MACT in order to comply with the MACT emission limitation (MEL) if a demonstration can be made that an alternate control strategy can achieve the required emission reductions. For majors sources that are already using some control strategy, the additional required control (ARC) for that major source can be computed by first subtracting the MACT emission limitation from the controlled emission level (CEL) of the emission unit as follows:

$$D_{(M-C)} = MEL - CEL$$

where MEL = MACT emission limitation
and CEL = Controlled emission level

The CEL is the maximum amount of HAP that could be emitted from the emission unit under the major source's current design specification and at full capacity utilization taking into consideration the application of federally enforceable controls. Acceptable methods for making this calculation are:

(a) Engineering calculations using material balance or emission factors;

(b) Any reported or measured emission that offers a true representation of yearly emissions;

(c) Average annual hourly emission rate multiplied by hours of operation;

(d) Emission limits and test data from EPA documents, including background information documents;

(e) Equipment vendor emission data and guarantees;

(f) State emission inventory questionnaires for comparable sources;

(g) Federal or State enforceable permit limits; or,

(h) For equipment leaks use, "Protocols for Equipment Leak Emission Estimates," EPA-453/R-93-026.

If MEL is based on a mass rate, production rate or concentration rate and $D_{(M-C)}$ is equal to zero or is a positive number, no additional control is required. The emission unit is currently meeting the criteria for MACT. If MEL is based on a

% removal and $D_{(M-C)}$ is equal to zero or is a negative value then no additional control is required. Otherwise the major source must reduce hazardous emission by the absolute value of $D_{(M-C)}$. That is:

$$ARC = 1\ D(M-C)\ 1$$

In some cases, it may only be necessary for the source to establish federal enforceability of existing State requirements to meet the MEL.

Chapter 6

Costs, Non-air Health and Environmental Impacts, and Energy Requirements

Section 112(d) of the Act specifies that if control technology alternatives are being considered to establish an emission standard that would result in emission limitations more stringent than the emission "floor"; or, if insufficient data exists to specify an emission limitation based on the MACT floor, then control technology alternatives must be evaluated by considering costs, non-air quality health and environmental impacts, and energy requirements associated with the expected emission reductions.

The costs, non-air quality health and environmental impacts, and energy requirements discussed below are illustrative only and are not intended as an exclusive list of considerations for MACT determinations. Some of these factors may not be appropriate in all cases, while in other instances, factors which are not included here may be relevant to the MACT determination. The discussion does not address the evaluation of each factor nor the weighing of any factor relative to another. Such determinations should be made on a case-by-case basis by the owner/operator and permitting agency. For the purpose of this discussion, terms such as "emission control system" or "MACT system" refer to design, equipment, or operating standards and inherently less

polluting processes, as well as add-on control equipment.

In general, the impact analyses for MACT determinations should address the direct impacts of alternative control systems. Indirect energy or environmental impacts are usually difficult to assess, but may be considered when such impacts are found to be significant and quantifiable. Indirect energy impacts include such impacts as energy to produce raw materials for construction of control equipment, increased use of imported oil, or increased fuel use in the utility grid. Indirect environmental impacts include such considerations as pollution at an off-site manufacturing facility which produces materials needed to construct or operate a proposed control system. Indirect impacts generally will not be considered in the MACT analysis since the complexity of consumption and production patterns in the economy makes those impacts difficult to quantify. For example, since manufacturers purchase capital equipment and supplies from many suppliers, who in turn purchase goods from other suppliers, accurate assessment of indirect impacts may not be possible. Raw materials may be needed to operate control equipment, and suppliers of these resources may change over time. Similarly, it is usually not possible to determine specific power stations and fuel sources which would be used to satisfy demand over the lifetime of a control device.

In most cases, duplicative analyses are not required in preparing the MACT impact analyses. Any studies previously

performed for Environmental Impact Statements, water pollution permits, or other programs may be used when appropriate; however, the permitting agency may consider any special economic or physical constraints which might limit the application of certain control techniques to an existing emission unit, such as retro-fitting costs that would not be borne by a new unit, or the remaining useful life of the emission unit. The result may be that the level of control required for an existing emissions unit may not be as stringent as that which would be required if the same unit were being newly constructed at an existing plant or at a "greenfield" facility. However, in no event shall the level of control yield an emission limit less stringent than the MACT floor when information is available to compute the MACT floor.

6.1 Cost Impacts

Cost impacts are the costs associated with installing operating, and maintaining alternative emission control systems (add-on emission control devices or process changes.) Normally, the submittal of very detailed and comprehensive cost data is not necessary. Presentation of the quantified costs of various emission control systems (referred to as control costs,) coupled with quantities of HAP emission reductions associated with each of the emissions control systems, is usually sufficient.

Once the control technology alternatives and emission

performance levels have been identified, total capital investment and total annual cost should be developed. Total capital investment (purchased equipment plus installation) and total annual costs of each emission control system should be presented separately. Total annual coasts are comprised of operation and maintenance costs ("direct annual costs",) administrative changes ("indirect annual costs"), plus overhead, taxes, insurance, and capital recovery costs minus recovery credits (credit for product recovery and by-product sales generated from the use of control systems and other emission reduction credits.) These costs should be reported in equal end-of-year payments over the time of the equipment. Total annual costs should be reported on an overall basis, as well as an incremental basis. The various emission control systems should be presented or arrayed in terms of increasing total annual cost. The incremental annual cost of a particular emission control system is the difference in its cost and the cost of the next less stringent control.

A method for determining the excessiveness or acceptability of control costs is the comparison of the cost-effectiveness of alternative control systems. Cost-effectiveness is the ratio of total annual costs (calculated using the above guidelines) to the total amount (tons or Mg) of HAP removed. Incremental cost effectiveness is calculated using the same procedure as outlined for calculating incremental annual cost. Generally, cost-effectiveness falling within the range of previously acceptable

MACT decisions are not considered excessive. Therefore, consistency with the relative cost, or cost effectiveness, of a past MACT determination for a similar source is an indication that such a cost is reasonable for the MACT determination in question.

For most MACT determinations, a cost analysis focusing on incremental cost-effectiveness of various MACT alternatives is sufficient. The analysis should include and distinguish the various components used to calculate the incremental cost-effectiveness of the control alternatives (i.e., lifetime of the equipment, total annual costs, tons of total HAP removed, etc.).

If there is reason to believe that the control costs place a significant burden on the entity being controlled, then the cost analysis should include financial or economic data that provide an indication of the affordability of a control relative to the source. For example, if the per unit cost is a significant portion of the unit price of a product or if the economic status of the industry is declining, then the cost analysis should present the relevant economic or financial data. Financial or economic data should include parameters such as after-tax income or total liabilities. An example of a financial criterion used to determine affordability would be the ratio of a facility's capital costs to the facility's parent company's total liabilities. This ratio would provide an assessment of the company's capital structure.

6.2 Environmental Impacts

The environmental impacts concentrate on collateral environmental impacts due to control of emissions of the pollutant in question, such as solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts (e.g. visible steam plume), or emissions of other air pollutants. The applicant should identify any environmental impacts associated with a control alternative that has the potential to affect the selection or rejection of that control alternative. Some control technologies may have potentially significant secondary environmental impacts. Scrubber effluent, for example, may affect water quality and land use, and, similarly, technologies using cooling towers may affect visibility. Other examples of 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 one control option is only marginally greater than the next most effective option.

The procedure for conducting an analysis of environmental impacts should be made based on a consideration of site-specific circumstances. In general, 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. Initially, a qualitative or semi-quantitative screening can be 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. As previously mentioned, the analysis need only address those control alternatives with any environmental impacts that have the potential to affect the selection or rejection of a control alternative. Pertinent information about the public or environmental consequences of releasing these materials should also be assembled. Thus, the relative environmental impacts (both positive and negative) of the various alternatives can be compared with each other.

Also the generation or reduction of toxic and hazardous emissions other than those for which the MACT determination is being made and compounds not regulated under the Clean Air Act are considered part of the environmental impacts analysis. A permitting authority should take into account the ability of a given control alternative for regulated pollutants to affect emissions of pollutants not subject to regulation under the Clean Air Act in making MACT decisions. Consequently, the ability of a given control alternative to control toxic or hazardous air contaminants other than those for which the MACT determination is being made, should be considered in the MACT analysis.

6.3 Energy Impacts

Energy impacts should address energy use in terms of penalties or benefits associated with a control system and the direct effects of such energy use on the facility. A source may, for example, benefit from the combustion of a concentrated gas stream rich in volatile organic compounds; on the other hand, extra fuel or electricity is frequently required to power a control device or incinerate a dilute gas stream. If such benefits or penalties exist, they should be quantified to the extent possible.

In quantifying energy impacts, the application could estimate the direct energy impacts of the control alternative in units of energy consumption at the source (e.g., Btu, Kwh, barrels of oil, tons of coal). The energy requirements of the control options could be shown in terms of total and/or incremental energy costs per ton of pollutant removed. In many cases, because energy penalties or benefits can usually be quantified in terms of additional cost or income to the source, the energy impacts analysis can be converted into dollar costs and, where appropriate, be factored into the cost analysis.

Indirect energy impacts (such as energy to produce raw materials for construction of control equipment) are usually not considered. However, if the reviewing agency determines, either independently or based on a showing by the applicant, that an indirect energy impact is unusual or significant, the indirect

impact may be considered. The energy impact should still, however, relate to the application of the control alternative and not to a concern over energy impacts associated with the project in general.

The energy impact analysis may also address the concern over the use of locally scarce fuels. The designation of a scarce fuel may vary from region to region, but in general a scarce fuel is one which is in short supply locally and can be better used for alternative purposes, or one which may not be reasonably available to the source either at the present time or in the near future.

Chapter 7.0

Sources of Information

There are currently several programs under development to house and disseminate toxics information. Some of these programs are designed for specific, narrow purposes, while others are employed in a broader range of uses. Most data collection programs are designed to be compatible with the Aerometric Information Retrieval System (AIRS)/AIRS Facility Subsystem (AFS).

The purpose of this chapter is to present various sources of toxics information which are available in a database format. EPA believes the requirements of 112(j) can be less burdensome to both industry and States by employing a database system to document similar-category sources and provide a bibliography of information to make a sound MACT floor determination.

AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS) TOXICS PROGRAM

The Aerometric Information Retrieval System (AIRS) is designed to accommodate the expansion of emissions data. The Aerometric Information Retrieval System (AIRS) / AIRS Facility Subsystem (AFS) is a National Data System currently residing on the National Computer Center (NCC). The stationary source component of this system and replaced the old National Emission

Data System (NEDS) as the data repository for point source data (e.g., electric utilities, industrial plants and commercial enterprises). The AIRS/AFS system is expected to eventually provide the capabilities needed to house information from the Title V operating permits program.

Many States input their data directly into the Aerometric Information Retrieval System (AIRS) and perform calculations and retrievals. When a converter (an interface between AIRS and the State system) is used, the data can be input directly to the State system and to the appropriate fields in AIRS in a single step. Data can also be retrieved from AIRS directly, or into the State format using a converter.

Since many data sources are fed into AIRS/AFS, the system becomes a repository of a vast amount of data. Much of this data may be useful for case-by-case MACT determinations and MACT standards. This advantage is expected to become more visible as the search for the 12% floor for a source category becomes a common occurrence.

Some State data, such as hazardous air pollutant data, is not generally found in the State systems because it is not needed for their current reporting requirements. However, some of this information can be found in the files documenting source categories and processes of industry reports. States may wish to enhance their current systems to hold such additional data fields and data elements from their participating industries.

INFORMATION COLLECTION REQUESTS (ICR) DATA

For the national MACT standards program, the EPA is currently involved in data collection activities for many of the source categories on the list. These data collection activities are designed to help answer, for a given category, a number of important questions:

-- What are the sources of emissions for the category?

-- Which HAPs are emitted and at what rates?

-- What alternatives are available to reduce those emissions?

-- What costs would be imposed for the control alternatives, and what economic impacts would the alternatives have on the business climate for the industry?

-- Which alternatives meet or exceed the "MACT floor" (for new sources, the "best controlled similar source;" for existing source, the level achievable by the "average of the best performing 12 percent" of sources in the category)

-- Given the alternatives available, which alternative represents the "maximum degree of reduction achievable," taking into account costs, benefits, and the constraints imposed by the "MACT floor?"

THE PROPOSED MACT DATABASE

The same general types of questions that EPA currently looks at for MACT standards, States or industry owner/operators would be called upon to address in making case-by-case MACT determinations in accordance with Sections 112(g) and 112(j). It is probable that many such case-by-case MACT determinations will

be needed (particularly for Section 112(g) purposes) before extensive nationwide data collection efforts will be completed by the EPA. For such situations, there has been significant concern on the part of industry that the effort needed for a MACT determination could lead to substantial delays. In addition, States have expressed concerns regarding the manpower requirements for MACT determinations, and regarding the availability of data for making "MACT floor" determinations. The project to establish a data base for MACT determinations (called the MACT database) was initiated to address those concerns. The project may also serve to assist EPA in its own data collection efforts for the 7 and 10-year MACT categories for which national data collection efforts have not yet begun.

Several documents have been released in draft form to explain and give guidance to potential users of the MACT Database. For further information on this subject, a scoping document on the MACT Database is available on the Office of Air Quality Planning and Standards (OAQPS) Technology Transfer Network (TTN) Bulletin Board. This information can be found on TTN under the menu (J) Airs Data and submenu (M) MACT data. For more information on this project, contact Susan Fairchild-Zapata at 919-541-5167.

BACT/LAER CLEARINGHOUSE INFORMATION SYSTEM (BLIS)

The BACT/LAER Clearinghouse, or the BACT/LAER Information

System (BLIS) is a database consisting of best achievable control technology (BACT) determination information on specific sources, to a process level. Database parameters include facility information; process description; pollutant information; control device type, installation date, efficiency; and calculation method; and stack test information if it exists.

Participation in BLIS is on a voluntary basis. If participation in BLIS increases, it may be able to provide sufficient information to determine the 12% floor with increasing accuracy. For more information on BLIS, contact Bob Blaszczak at 919-541-5432.

GREAT WATERS PROGRAM

The Great Waters program requires HAP emissions data for most of the U.S. and portions of Canada. The Great Lakes region probably requires the most attention. Biennial assessments with reports to Congress are required under the Great Waters program. Updates of the emission inventory are anticipated to support both the periodic assessments and refine dispersion models as they become available. For additional information on the Great Waters Program, contact Amy Vasu at 919-541-0107.

FIRE: RATED AIR TOXIC EMISSION FACTORS

The requirements of the CAAA dictate immediate sampling and

analysis to obtain data for determination of emission factors. Emission factors are used in lieu of emission estimates based upon source testing, and estimate the emissions of a particular HAP per unit process rate (i.e., pounds of nickel emitted for each ton of nickel ore processed). These emission factors can be based on controlled and uncontrolled processes, and can therefore be used to help determine which control measures are best suited to a particular process. EPA developed screening methods for the development of air toxics emission factors, and applies the screening to test results as they become available for use.

The toxic emission factors available through FIRE are rated A (most reliable, based on several tests meeting high confidence criteria) through E (least reliable, having limited available information), similar to the way criteria emission factors are presented in the AP-42. Toxic emission factors are being developed for 400 toxic compounds, of which about 170 are on the list of 189 HAPs in Section 112(b), representing many (but not all) processes in Section 112 source categories.

About 40 of the HAPs in FIRE have been targeted as "critical" pollutants because they are found in a wide variety of industries, and/or are especially toxic. This group of about 40 toxic compounds have a rating of A or B, enabling users to arrive at the most accurate emissions estimates presently possible. For more information on FIRE, contact Anne Pope at 919-541-5373.

TITLE V OPERATING PERMIT SYSTEM

The most far-reaching program established under the CAAA is that of a national operating permit program under Title V. The National Air Data Branch (NADB) is developing a database as a subsystem under AIRS/AFS to handle the information from Title V permits. This database is generally referred to as the permit system. Phase I of the Title V Operating permit system has been designed in AIRS/AFS. It is not expected to provide much of the information needed for determining the MACT floor for case-by-case MACT determinations or for MACT standards.

NATICH

The National Air Toxics Information Clearinghouse (NATICH) has been established by EPA to support State and local agencies in the control of non-criteria air pollutants. The NATICH program has both a database and a reporting capability.

The database component of the clearinghouse contains information on various air toxics regulatory programs administered through State and local agencies. Elements such as permitting, source testing, ambient monitoring, agency contacts, acceptable ambient limits and guidelines, and program overviews are all contained within the database. Information is collected on an annual basis by voluntary submittal from participating agencies.

Since its introduction in 1984, NATICH has undergone

periodic modifications in an attempt to expand and meet the needs of the user community. In the fall of 1989, a link was established between NATICH and the Toxic Release Inventory System (TRIS). A modification is in the planning stages to move the database from the NCC's IBM mainframe onto the OAQPS TTN Bulletin Board System for easier and wider accessibility. For more information on NATICH, contact Vasu Kilaru at 919-541-5332.

TOXIC RELEASE INVENTORY SYSTEM (TRIS)

This is a source of data that is used to identify HAP emitters by records of accidental releases. The TRIS database contains emissions data reported by individual industrial facilities as required under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1988. Emissions data in TRIS are reported on a plant wide basis. Standard Industrial Classification (SIC) Codes are reported in TRIS but the entries are usually not specific enough to identify categories of sources. The TRIS database is reportedly capable of identifying plants emitting pollutants listed in Section 112(b). For information on TRIS contact Vasu Kilaru at 919-541-5332.

STATE AIR OFFICE DATABASES

Emissions Standards Division (ESD) staff have been working with STAPPA/ALAPCO to better characterize the toxics information available in database form and hard copy within the State air offices.

Most States have compiled pollutant information in some form in response to State Implementation Plan (SIP) requirements. Many States also have toxics information collection systems, as well as State requirements for toxics programs. Most States find that although internally their system is widely used (intra-State system), to down load or upload data on an inter-State basis is nearly impossible (with the primary exception to this being States within a transport region, and then usually under limited circumstances). Many States have expressed a keen interest in a National database that each State could down load State-specific data into, and upload multi-State retrievals from. This capability is met by three main systems in EPA: BLIS, AIRS, and NATICH.

TRADE JOURNALS

Caution should be taken when employing these sources, especially in noting the method of emissions estimation, number of tests which were used in developing estimates, and the conditions under which tests were conducted. Other factors which may affect the emissions estimates should also be identified, and

the effects of their differences quantified as accurately as possible. Because results applicable to only one facility can not be completely accurate for other facilities, this source of information is not regarded as highly accurate, but may provide some useful information on control alternatives.

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Appendix A

The following detailed examples presented in this manual are for illustrative purposes only. Numbers and values presented in this Appendix do not necessarily reflect any known cases and are not meant to establish any US EPA position regarding MACT determinations for a particular MACT-affected source. These examples are fictitious and are designed to highlight many of the subtle aspects of the MACT determination process. In many cases, the scenarios and available control technologies have been grossly oversimplified to streamline the presentation of the examples.

Example 1

Determining the

MACT-Affected Emission Unit

The owner or operator of a major source in the metal furniture - surface coating source category is subject to a MACT determination under Section 112(j). The following is a description of the source and the operations at the facility:

A metal furniture manufacture produces military-specification office furniture for use in military barracks. The plant currently operates 2080 hr/yr and produces 12,000 units of furniture annually. Estimated emissions from the major source are 100 tpy of HAPs.

Existing unit operations include:

1) wood processing

Raw wood and formica are glued together to form a laminate. The glue is applied using an automatic application system. Several laminates are then positioned in a press for glue curing. Next, the boards undergo various woodworking operations including, cutting, drilling, and routing. Boards are either transferred to assembly or directly packaged and shipped. Tetrachloroethylene is a component of the glue. Glue stations are vented to emission stacks on

the ceiling. The stacks are currently uncontrolled.

The glue is stored in 50 gallon drums. Glue is transferred to the application equipment through a pumping mechanism. Estimated yearly emissions of HAP from this operation is 0.50 tpy.

2) Metal Processing

Metal stock is cleaned by immersion in a toluene dip tank. A toluene, grease, and dirt sludge is produced which is pumped from the bottom of the tank for disposal. After cleaning the metal undergoes various metalworking operations including cutting, punching, folding and welding. Pieces are partially assembled, then transferred to one of two paint coating operations. The dip tank is currently controlled with a condensing unit and a freeboard ratio of 0.75. Yearly controlled emissions are estimated at 19 tons/yr. Uncontrolled emissions are estimated at 55 tpy.

3) Cleaning operations:

The spray coating operations begins with a five-stage cleaning. The first stage is an alkaline-wash tank. Next, parts are sprayed with an iron phosphate solution. The fourth stage is a rinse tank. Finally, parts are sprayed with a rust preventive. After cleaning, the parts are conveyed to a dry-off oven and then

the paint coating line. No HAP emissions occur during this part of the operation.

4) Painting operations:

There are currently four spray booths in the paint coating operation, and one dip-spray tank. Large metal parts are coated using the spray booths. A one color coating is applied at a coating depth of 1 ml. Two of the booths are equipped with continuously recirculating water curtains to entrap paint overspray. Entrapped paint solids and wastewater are dumped to a holding tank periodically. Air filters are used in the two remaining spray booths. The Air filters are periodically replaced. The used filters are placed in storage drums for later disposal.

All spray booths are equipped with hand-held spray guns. Transfer efficiency is estimated at 45% for both types of booths. The paint is a high solvent paint containing xylene and toluene with an estimated 35% solids content and 65% solvent content. The spray guns are periodically sparged and rinsed with acetone to prevent clogging. The acetone paint mixture is sent to storage tanks for later disposal. Emissions from the booths are currently vented to the roof with no control devise.

After painting parts are conveyed through a flash-off area to one of two dry-off ovens and then to assembly. Small metal parts are dip-painted, allowed to air dry, and then transferred

to the assembly area.

Total annual HAP emissions from this area are estimated at 55 tpy. Each spray booth contributes 8 tpy and each drying oven 4 tpy. Estimated emissions from the dip-spray tank are 15 tpy. No emission estimates are available for the flash-off area.

From this description the following emission points are indentified as potentially "affected emission points" by the Section 112(j) MACT determination process:

glue storage drums
glue stations (stack emissions)
    --application equipment
    --curing presses
dip tank*
toluene storage tanks*
toluene/sludge waste storage tanks*
spray booths (stack emissions)
    -- feed and waste lines
    -- application equipment
spray dip-tank
flash-off area (large parts)
drying area (small parts)
paint storage tanks
solvent storage vessels
paint sludge storage tanks
drying ovens (stack emissions)
Air filter storage drums

* These unit would be eliminated from any MACT-affected emission unit because the emission points would be part of the degreasing source category, not the miscellaneous metal parts surface coating source category.

Possible MACT-affected emission unit scenarios:

Scenario #1 There would be five MACT-affected emission units:

Wood processing
Spray coating operations
Storage tanks
Equipment leaks
storage drums

The above scenario could make sense if a MACT floor could be identified or control technologies could be applied to the emission units. In wood processing the emissions are vented to a stack on the roof. These emissions could be controlled with a variety of add-on control devices. The source could also consider switching to a glue that has a lower concentration of a HAP or does not contain any HAPs.

In the spray operations, the source could switch to a low solvent paint or water-based paint. This control option would need to be weighed against controlling the individual emission points. Other control options to consider would be an add-on control devise to control the stack emissions from the spray booth and oven, increasing the transfer efficiency of the spray application equipment, and controlling the drying, flash-off areas, and the dip-spray tank with separate control technologies.

Controlling the storage tanks as one emission unit may allow flexibility in meeting MACT. Some tanks could remain under controlled while others could be over-controlled. This option

would need to be weighed against the cost effectiveness and emission reductions of applying controls to all of the storage tanks. The storage drums could be placed in a contained area and the emissions vented to one control devise.

Scenario #2

Stack emissions (spray booths, glue stations, drying ovens)
storage tanks and drums
equipment leaks
dip-spray tank

In this scenario, the stack emissions from the spray booths, glue stations and drying oven could all be vented to a single control devise. This option would need to be weighed against the emission reductions that could be obtained by applying pollution prevention strategies to the individual operations. If the storage tanks and drums are stored in a common location, such that the emissions from the area could be vented to a control devise, this emission point aggregation could make sense. The emission reduction would need to be weighed against controlling the emission points separately. If greater emission reductions could be obtained by controlling these points separately, this aggregation of points may not be acceptable.

Scenario #3

each storage tank
each spray booth
stack emissions from glue stations and drying oven
equipment leaks
each storage tank
each storage drum
dip-spray tank

This scenario would generally be acceptable unless a pollution prevention method could be applied to one of the processes that could obtain a greater degree of emission reductions then point-by-point compliance.

Scenario #4

All emission points

This scenario would generally be unacceptable because equipment leak emissions should not be included in a source category wide emission unit.

Scenario #5

equipment leaks
remaining emission points

This aggregation of emission units could be acceptable if emissions information were available on HAP emissions or control technologies from the source category as a whole, or if the nature of the industry demanded a large degree of flexibility in the application of MACT. A rationale for this conglomeration would be necessary.

Example 2

Using Control Efficiency Ratings to Determine the MACT Floor

A MACT determination is to be conducted on a quenching process at a coke-by product plant. Hazardous emissions can be released when the hot coke in the quench car is sprayed with water to decrease the coke's temperature. Phenol and naphthalene emissions can occur in the gaseous state. Other pollutants can sorb to particulate matter and be collectively released. The permitting agency will need to conduct a MACT analysis to determine the MACT emission limitation based on the emission reduction that can be achieved by MACT. The permitting agency will begin with the Tier I analysis.

Steps 1) Identify the MACT-affected emission unit(s)

MACT-affected source: quenching tower and coke car

# of existing sources: 36

The equipment used in this production process include the quenching tower, the coke car, water delivery system, and water storage system. The permitting agency decides that emission points from the quenching tower and coke car should be considered one MACT-affected emission unit, and the water delivery system and water storage system as another affected emission unit. The example will be continued for only the quench tower/coke car emission unit.

The permitting agency is able to find the following information:

Step 2) Make a MACT floor Finding

	Technology	# of plants using	%efficiency
1)	Use clean water to quench coke with baffles at the top of the quench tower	10	not quantifiable
2)	Use covered quenched car. Cool outside of car. Water does not impact coke. Place car on cooling rack after quenching for additional heat dissipation.	1	almost 100%
3)	Wet scrubber, connected to fixed duct system	10	80-90%
4)	Wet scrubber, mobile unit attached to coke quench car	14	80-90%
5)	Dry quenching with inert gases. Heat transported to waste-heat boiler	1	99-100%

The permitting agency decides to use the control efficiency ratings to determine the MACT floor. There are a total of 36 existing sources. The MACT floor would be equivalent to the arithmetic mean of the control efficiency ratings for the best five sources. If a specific control efficiency rating is not available for the best performing five sources, a median or mode could be used to calculate the MACT floor. Using the information provided, the median of the best performing 12% of sources would be equal to 80-90% or control technology 3 or 4. The mode would be technology number 4.

Step 3 Identify MACT

Technologies 2, 3, 4, or 5 could be chosen as MACT. Number 1 could also be consider because its control efficiency is not quantifiable. If technology 1 is to be considered further, a more detailed analysis would be required to prove that the technology could obtain an equal or greater amount of emission reductions. In this case, the efficiency of technology 1 will vary by the concentration of hazardous constituents. Using clean water could result in a less toxic release when the concentration of toxins in the hot coke are less, but increased emissions could result with increased concentrations. The other proposed technologies would operate at a relatively constant efficiency rate, regardless of the pollutant concentration. Therefore,

technology number 1 would be considered inferior and should be eliminated as a potential candidate.

The permitting agency should identify MACT based on the control technology that achieves a maximum degree of emission reduction with consideration to the costs, non air quality health and environmental impacts and energy requirements associated with use of each conntrol technology. After identifying MACT, the permitting agency would proceed to Tier III of the analysis.

Example 3

When the MACT floor is Determined using Emission Reduction Ratios

Description of Source

A surface coating operation treats a product with its existing equipment consisting of a dip-tank priming stage followed by a two-step spray application and bake-on enamel finish coat. The product is a specialized electronics component (resistor) with strict resistance property specifications that restrict the types of coatings that may be employed.

Step 1) Identify the MACT-affected emission unit(s)

MACT-affected emission units -

1. dip-tank
2. feed and waste lines in prime coating operation
3. spray coat booth, spray coat application equipment
4. drying oven
5. storage tank in prime coating operation
6. storage tank in finish coating line

There are two process units within this source category: the prime coating line and the finish coating line. Equipment within the prime coating line that have affected emission points are a dip-tank, storage containers, feed line to supply new coating into the dip-tank, a waste line to drain the dip-tank. Because

the feed line and waste lines have equipment leak emissions, these emission points should be combined to form a MACT-affected emission unit. The permitting agency will consider the dip-tank and each storage container a separate affected emission unit. The three MACT-affected emission units in this process unit are the dip-tank, the storage container, and the feed and waste lines.

The finish coating line consists of two spray booths, spray application equipment, paint supply system, a storage container, and a drying oven. The permitting agency decides to combine affected emission points to form the following MACT-affected emission units: the spray application equipment and spray booths; the paint supply system, the storage container, and the drying oven. For simplicity of this example, the MACT analysis will be continued for only the spray application equipment and spray booths.

Step 2) Make a MACT floor finding

Steps A and B: Computing the Uncontrolled Emissions and Controlled Emissions

Overview Analysis of emissions information for similar emission units within the source category:

	Technology	# of sources using
1)	water-based coat	2
2)	low-VOC solvent/high solids coat	4
3)	electrostatic spray application to enhance transfer efficiency	7
4)	low voc solvent/high solids coating with electrostatic spray application	8
5)	powder coat paint with electrostatic spray application	1
6)	high-voc solvent coating	8

Detailed analysis

Source	Technology #	Uncontrolled emissions (tons/yr)	Controlled emissions (tons/yr)	Emission reduction ratio
1	6	10	10	0
2	3	26	14	.46
3	2	48	22	.54
4	3	86	56	.35
5	3	98	55	.44
6	6	26	22	.15
7	6	35	34	.03
8	3	78	55	.29
9	2	69	25	.64
10	2	15	11	.27
11	6	11	11	0
12	6	12	12	0
13	6	23	22	.04
14	3	85	52	.39
15	2	141	89	.39
16	3	25	20	.20
17	4	159	100	.37
18	5	126	11	.91
19	4	35	14	.6
20	3	25	16	.36
21	4	68	22	.70
22	4	46	10	.78

Source	Technology #	Uncontrolled emissions (tons/yr)	Controlled emissions (tons/yr)	Emission Reduction Ratio
23	1	95	10	.89
24	6	96	16	.83
25	4	64	25	.61
26	4	98	31	.68
27	4	168	45	.73
28	4	196	63	.68
29	6	186	186	0
30	1	255	26	.90

Step C Computing the Emission Reduction Ratio for the MACT-Affected Emission Unit

Because there are 30 sources, the MACT floor should be based on the arithmetic mean of the emission reduction ratios achieved by the best 12% of existing emission units. Twelve percent of 30 emission units is equal to 3.5 sources. The owner or operator should round up all fractions to the next largest number. The MACT floor would be equal to the arithmetic mean of the emission reductions obtained by the best 4 sources in the source category. Reviewing the data above the MACT floor would be equal to an emission reduction ratio of 0.88 ([0.91 + 0.90 + 0.89 + 0.83]/4) or the emission reductions that can be achieved when control technologies 1 or 5 are used.

Step D Determine a MACT emission limitation (MEL)

The permitting agency calculates an uncontrolled emission rate for the MACT-affected emission unit based on the normal operation of the emission unit. Emission reductions obtained through a pollution prevention strategy would not be included in the UCEL calculation. The permitting agency calculates the UCEL for this emission unit to be 125 tons/yr total HAPs. Based on this UCEL, The MEL for this emission unit would be

$$MEL = 125 \text{ tons/yr} * (1 - 0.88)$$

$$= 15 \text{ tons/yr}$$

The permitting agency would advise the permit applicant of

the MEL and allow the applicant to determine how this level of emission reductions will be achieved.

Step 4 Select a control technology to meet the MACT Emission Limitation.

In this example, the nature of the product requires a specific type of coating and because of this the applicant is unable to use any of the reviewed technologies to meet the MEL. The owner and operator will analyze other control technologies that are applied to control similar emission points. In this example, the similar emission points have operational losses. Review of control technologies to control operational losses identifies add-on control devises such as a carbon absorber, a thermal or catalytic incinerator, or a condenser. The owner or operator should conduct a costs, non-air quality health and environmental impacts and energy requirements analysis on the available control technologies.

The major source already has a catalytic incinerator on site. The emissions from the spray application equipment and spray booth could be channeled to the incinerator. This would require the installation of a venting system including a pump mechanism. It would also require an increased volumetric flow rate to the incinerator and increase auxiliary fuel requirements. The incinerator had been operating at a 90% efficiency. With an increased volumetric flow rate, the efficiency is projected to

drop to 87% efficiency. The owner and operator must obtain an additional 1% emission reductions. Possible control technologies include increasing the operating temperature of the incinerator, or adding electrostatic application to the spray process to enhance transfer efficiency. Limiting the hours of operation at the MACT-affected emission unit could be considered if the reduced production were part of an overall source reduction program.

Use of the specialized coating in this operation will increase the concentration of hazardous pollutants in the water used for the water curtain. The proposed control technology does not affect the concentration of pollutants in the wastewater. This could be considered a negative environmental impact and may be reason to consider another control technology to meet the MACT emission limitation. In this instance, the owner or operator will not violate the NPDES permit, so the control technology will not be eliminated from consideration.

The owner or operator uses this step to demonstrate that despite the increase in volumetric flow rate and the auxiliary fuel requirement, a significant increase in CO_2 emissions does not occur. The owner or operator concludes that the impacts associated with use of this technology are reasonable.

After reviewing the technologies the owner or operator selects the incinerator with a limit on the hours of operation.

The owner or operator proposes to start a training program for spray booth operators to decrease the error and product rejection rate. By doing this, the owner or operator can reduce the hours of operation and still meet customer demands for the product. This option is chosen over the other two because increasing the incinerator's operating temperature would require additional auxiliary fuel input, and enhancing the transfer efficiency with electrostatic application would be cost prohibitive. The owner or operator would document that use of the selected control technologies can reduce emissions to the required level.

Example 4

When the MACT floor is Equal to "No Control"

A commercial treatment storage and disposal facility receives off-site wastes from various pesticide manufacturers. A solvent/aqueous/pesticide mixed waste is passed through a distillation column where the organic solvents are vaporized and then condensed into a distillate receiver. The solvent is transferred using tank cars to a tank farm that is located at another portion of the plant. The low-grade solvent is then sold to industrial users. The pesticide-laden wastewater is then passed through a series of carbon adsorbed where the majority of pesticide is removed from the water. The water is then discharged to a Publically Owned Treatment Works (POTW). The carbon adsorbers are periodically steam stripped to regenerate the carbon.

Step 1) Identify the MACT-affected emission unit(s)

MACT-affected emission units:

1) each storage tank
2) the distillation column, condenser, and distillate receiver
3) the three carbon absorber
4) pumps, feed lines and transfer lines
5) loading racks

The two process units that contain emission points affected by this modification are the recycling process, and the tank farm. The equipment and apparatus associated with the affected

emission points are pumps, feed lines, a distillation column, a condenser, a distillate receiving tank, three carbon absorber and transfer lines, and a loading rack. The permitting agency will consider the three carbon absorbers and the associated emission points as one emission unit because a single control technology could be practically design to cover all three affected emission points. The permitting agency will also group the distillation column, distillate receiver and condenser into one MACT-affected emission unit. The feed lines, pumps, and transfer lines would have equipment leak emission losses and would be another affected emission unit. The permitting agency decides to consider the emission points and equipment for the loading rack and tanks as separate MACT-affected emission units. If all the tanks were structurally similar in design one determination could be made that would be applicable to all the tanks.

Step 2) Make a MACT floor finding

For simplicity of this example, the MACT analysis will only be continued for a tank emission unit. All the storage tanks will be structurally similar, so only one MACT determination will be required. The permitting agency reviews existing data bases and determines that less than 12% of tanks in the source category are controlled. Therefore the MACT floor is equal to "no control". This is not automatically an acceptable "control" measure, so the owner or operator will move to Tier II of the

MACT analysis. In Tier II of the analysis control technologies for similar emission points from outside the source category will also be considered.

Tier II - Step 1 List All Available Control Technologies

The following technologies have been identified as possible control technologies that can be applied to a storage tank to control working and breathing emission losses:

		Emission control efficiency
1.	fixed-roof	86-99
2.	fixed-roof plus internal floating roof	97-99
3.	fixed roof vented to a carbon canister	95-100
4.	fixed-roof vented to a combustion devise	99-100
5.	fixed-roof vented to carbon absorber	99-100
6.	pressure tank	95-99

Step 2 Eliminate Technically Infeasible Control Technologies

All of the available control technologies are technically feasible.

Step 3) Conduct a Non-air Quality Health, Environmental, Economic and Energy Impacts Analysis

The following series of tables illustrate a non-air quality health, environmental, cost and energy impacts analysis for each control option.

Table 1 presents information describing the various control technologies that are technically feasible. Secondary air impacts as well as energy impacts and other resource demands.

Table 1

Control Option	Secondary Air Impacts	Resource Demands
1 fixed roof	none	none
2 fixed roof + internal roof	none	none
3 pressure tank	none	none
4 cover and vented to carbon canister	emission if carbon regenerated	disposal of container, solvents for regeneration
5 cover and vent to combustion devise	increased CO, NOx, SOx, and particulate emissions	fuel source, disposal of ash
6 cover and vent to carbon absorber	emissions when carbon regenerated	disposal of spent carbon, solvents for regeneration

Table 2 presents the control options along with their costs and emission reductions. The average cost effectiveness of each control option is also presented. The average cost effectiveness is the ratio of the total annual cost to the total amount of HAP removed. Note that the control options are presented in terms of increasing annual cost (i.e., control option 1 has the smallest annual cost, control option 2 has the second smallest annual cost, etc.)

Using Table 2, several control options can be eliminated from further consideration. Control option 3 should be eliminated because control option 2 achieves the same amount of HAP reductions but at a lower cost. Control option 2 should be eliminated because control option 4 achieves a greater degree of emission reduction for lower cost. The elimination of control options 2 and 3 reduces the number of technically feasible and economically efficient options to four control technologies.

Table 3 presents the incremental cost effectiveness of the remaining options. The incremental cost effectiveness of control option 1 is the same as its average cost effectiveness since control option 1 is the first incremental option from the baseline. The incremental cost effectiveness of control option 4 is the ratio of the difference in cost between options 1 and 4 to the difference in HAP emission reductions between the two ratios.

Table 2

CONTROL OPTION	CONTROL EFFICIENCY	ANNUAL COST ($)	EMISSION REDUCTION (Mg/Yr)	AVERAGE COST-EFFECTIVENESS ($/Mg)
1	93	85,000	72	1,161
2	96	113,000	88	1,264
3	96	232,000	88	2,636
4	98	110,000	92	1,156
5	99	136,000	103	1,320
6	100	189,000	117	1,615

Table 3

CONTROL OPTION	ANNUAL COST ($)	EMISSION REDUCTION (Mg/Yr)	AVERAGE COST-EFFECTIVENESS ($/Mg)	INCREMENTAL COST EFFECTIVE-NESS ($/Mg)
1	85,000	72	1,161	
4	110,000	92	1,156	1,250
5	136,000	103	1,320	2,364
6	189,000	117	1,615	3,766

Step 4) Identify MACT

Examination of the cost effectiveness of the various control options can lead to the elimination of some control options. Control option 6 is eliminated because the incremental cost is deemed too high. The incremental cost of control option 5 is deemed acceptable but upon closer examination, the secondary air and energy impacts make this option undesirable. The incremental cost of both options 1 and 4 are deemed acceptable; however, control option 1 is eliminated because other considerations (secondary air impacts, etc) do not preclude the selection of control option 4 which achieves a greater degree of emission reductions.

Appendix B

DEFINITIONS

Act - the Clean Air Act as amended in 1990 (42 U.S.C. 7401 et seq., as amended by Pub. L. 101-104 Stat. 2399).

Administrator - the Administrator of the United States Environmental Protection Agency or his or her authorized representative (e.g a State that has been delegated the authority to implement the provisions of this part.)

Affected emission point - an emission point that is part of an emission unit requiring a MACT determination.

Alternative test method - any method of sampling and analyzing for an air pollutant that is not a test method in 40 CFR Part 63 and that has been demonstrated to the Administrator's satisfaction, using Method 301 in Appendix A of Part 63, to produce results adequate for the Administrator's determination that it may be used in place of a test method specified in that part.

Approved permit program - a State permit program approved by the Administrator as meeting the requirements of 40 CFR Part 70, or a Federal permit program in Chapter 40 of the CFR established pursuant to Title V of the Act (42 U.S.C. 7661).

Controlled emissions - the maximum amount of HAP that could be emitted from the emission unit under the major source's current design specification and at full capacity utilization taking into consideration the applciation of federally enforceable controls.

Control technology - measures, processes method, systems, and techniques to limit the emission of hazardous air pollutants including, but not limited to, measures which

(1) reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution or materials or other modifications,

(2) enclose systems or processes to eliminate emissions,

(3) collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point,

(4) are design, equipment work practice, operational standards (including requirements for operator training or

certification) as provided in subsection (h), or

(5) are a combination of above.

Commenced - with respect to construction or reconstruction of a stationary source, that an owner or operator has undertaken a continuous program of construction or reconstruction that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction, reconstruction, or modification.

Compliance date - the date a MACT-affected emission unit is required to be in compliance with the MACT emission limitation.

Construction - on-site fabrication, erection, or installation of an emission unit.

Continuous emission monitoring system (CEMS) - the total equipment that may be required to meet the data acquisition and availability requirements 40 CFR Part 63, used to sample, condition (if applicable), analyze, and provide a record of emissions.

Continuous monitoring system (CMS) - a comprehensive term that may include, but is not limited to, continuous emission monitoring systems, continuous parameter monitorin gsystems, or other manual or automatic monitoring that is used for demonstrating compliance with an applicable regulation on a continusous basis as defined in a permit or regulation.

Effective date - the date a Notice of MACT Approval is signed and issued by a permitting agency, or the date specified in a promulgated emission standard.

Emission Unit - one emission point or the collection of emission points within a major source requiring a MACT determination. An emission unit can be defined (by the permitting authority) as any of the following:

(1) An emitting point that can be individually controlled, e.g. a boiler, a spray booth, etc.

(2) The smallest grouping of emission points, that, when collected together, can be commonly controlled by a single control device or work practice.

(3) A grouping of emission points, that, when collected together, can be commonly controlled by a single control device or work practice.

(4) A grouping of emission points that are functionally related. Equipment is functionally related if the

operation or action for which the equipment was specifically designed could not occur without being connected with or relying on the operation of another piece of equipment.

(5) A grouping of emission points that, when collected together, comprise a building, structure, facility, or installation.

Existing Source - a source that is not constructed or reconstructed.

Federally enforceable - all limitations and conditions that are enforceable by the Administrator and citizens under the Act or that are enforceable under other statutes administered by the Administrator. Examples of federally enforceable limitations and conditions include, but are not limited to:

(1) Emission standards, alternative emission standards, alternative emission limiations, and equivalent emission limitations established pursuant to Section 112 of the Act as amended in 1990;

(2) New source performance standards established pursuant to Section 111 of the Act, and emission standards established pursuant to Section 112 of the Act before it was amended in 1990;

(3) All terms and conditions in a title V permit, including any provisiosn that limits a source's potential to emit, unless expressly designated as not federally enforceable;

(4) Limitations and conditions that are part of an approved State Implementation Plan (SIP) or a Federal Implementation Plan (FIP);

(5) Limitations and conditions that are part of a Federal construction permit issued under 40 CFR 52.21 or any construction permit issued under regulations approved the the EPA in accordance with 40 CFR Part 51;

(6) Limitations and conditions that are part of an operation permit issued pursuant to a program approved by the EPA into a SIP as meeting the EPA's minimum criteria for Federal enforceability, including adequeate notice and opportunity for EPA and public comment prior to issuance of the final permit and practicable enforceability;

(7) Limitations and conditions in a State rule or program that has been approved by the EPA under subpart E of Part 63 for the purposes of iimplementing and enforcing Section 112; and

(8) Individual consent agreements that the EPA has legal authority to create.

Fugitive emissions - emissions from a stationary source that could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening.

Hazardous Air Pollutant (HAP) - any air pollutant listed in Subpart C of 40 CFR Part 63 pursuant to Section 112(b) of the Act.

Maximum achievable control technology (MACT) - a control technology that achieves a maximum degree of reduction in emissions of the hazardous air pollutants with consideration to the costs of achieving such emission reductions, and the non air quality health and environmental impacts and energy requirements.

MACT-affected emission unit - an emission unit or source requiring a MACT determination.

MACT analysis - the process an owner/operator conducts to define the MACT floor, recommend a MACT emission limitation, and select the MACT.

MACT determination - a process conducted by the Administrator or the permitting agency to evaluate a major source's ability to comply with the requirements of 40 CFR Part 63, Subpart B.

MACT emission limitation (MEL) - the maximum achievable control technology emission limitation for the hazardous air pollutants listed under Section 112(b) of the Act that the Administrator (or a State with an approved permit program) determines through a promulgated emission standard or on a case-by-case basis to be the maximum degree of reduction in emissions of the HAPs with consideration to the costs of achieving such emission reductions and the non air quality health and environmental impacts and energy requirements.

If the Administrator or reviewing agency determines that it is inappropriate to prescribe a numerical or efficiency based MACT emission limitation a specific design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice, or operation, and shall provide for compliance by means which achieve equivalent results.

MACT floor - for new sources or constructed or reconstructed major sources: a level of hazardous air pollutant emission control that is achieved in practice by the best controlled

similar source as determined by the Administrator.

For a existing sources or a modification to a major source the MACT floor is:

(a) the average emission limitation achieved by the best performing 12 percent of existing sources (for which the Administrator has emission information), excluding those sources that have, within 18 months before the emission standard is proposed or within 30 months before such standard is promulgated, whichever is later, first achieved a level of emission rate or emission reductions which compiles, or would comply if the source is not subject to such standard, with the lowest achievable emission rate (as defined by Section 171 of the Act) applicable to the source category and prevailing at the time, in the category or subcategory for categories and subcategories with 30 or more sources; or,

(b) The average emission limitation achieved by the best performing 5 existing sources for sources with less than 30 sources in the category or subcategory.

Major source - 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, unless the Administrator establishes a lesser quantity as codified in Subpart C of 40 CFR Part 63, or in the case of radionuclides, different criteria from those specified in this sentence.

Notice of MACT Approval - a document issued by a reviewing agency containing all federally enforceable conditions necessary to enforce the application of, and operation of MACT such that the MACT emission limitation is met.

Owner or operator - any person who owns, leases, operates, controls, or supervises a stationary source.

Part 70 permit - any permit issued, renewed, or revised pursuant to 40 CFR Part 70.

Permit program - a comprehensive State operating permit system

established pursuant to Title V of the Act and regulations codified in Part 70 of this chapter and applicable State regulations, or a comprehensive Federal operating permit system established pursuant to Title V of the Act and regulations codified Chapter 40 of the CFR.

Permit revision - any permit modification or administrative permit amendment to a Title V permit.

Promulgation deadline - for each source category the date by which EPA is required to establish emission standards for the source category in accordance with Section 112(c) of the Act. These dates are published in a regulatory schedule in the Federal Register.

Potential to emit - the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation of the capacity of the stationary source to emit a pollutant, including air pollution control equipment and restrictions on hour of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.

Project - all activities associated with construction, reconstruction, or modification of a source including design, fabrication, erection, installation and start-up.

Reconstruction - the replacement of components of an emission unit 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 entirely new source, and (2) it is technologically and economically feasible for the reconstructed source to meet the Section 112(d) emission standard(s), alternative emission limitation(s), or equivalent emission limitation(s) established by the Administrator (or a State with an approved permit program) pursuant to Section 112 of Act. Upon reconstruction, an affected source is subject to Section 112(d) standards for new sources, including compliance dates, irrespective of any change in emissions of hazardous air pollutants from that source.

Relevant standard - (1) an emission standard, (2) an alternative emission standard, (3) an alternative emission limitation, (4) an equivalent emission limitation established pursuant to Section 112 of the Act that applies to the stationary source, group of stationary soruces, or the portion of stationary source regulated by such standrd or limitation.

A relevant standard may include or consist of a design,

equipment work practice, or operational requirements or other measures, process, method, system or technique (including prohibition of emissions) that the Administrator (or a State with an approved permit program) establishes for new or existing source to which such stadard or limitation applies. Every relevant standard established pursuant to Section 112 of the Act includes Subpart A of this part and all applicable appendices of Parts 51, 60, 61, and 63 of Chapter 40 of the code of federal regulations that are reference in that standard.

Similar emission unit - two or more sources or emission units that have similar emission types and can be controlled using the same type of control technology.

Similar emission type - See Section 2.4 of Chapter 2.

Source - an emission unit, or as otherwise specified in an applicable 40 CFR Part 63 emission standard.

Start-up - setting in operation an affected emission unit for any purpose.

State - all non-federal permitting authorities, including local agencies, interstate associations, and State-wide programs, that have delegated authority to implement (1) the provisions of 40 CFR Part 63; and/or (2) the permit program established under Part 70 of this chapter. State shall have its conventional meaning where clear from the context.

Stationary source - any building, structure, facility or installation that emits or may emit any air pollutant.

Title V permit - any permit issued, renewed, or revised pursuant to Federal or State regulations established to implement Title V of the Act. A title V permit issued by a State permitting authority is called a part 70 permit.

Uncontrolled emissions - the maximum amount of HAP that could be emitted from the emission unit using current design specifications at full capacity utilization in the absense of controls.

Appendix C

Initial List of Categories of Major and Area Sources of Hazardous Air Pollutants

Fuel Combustion

Category Name
- Engine Test Facilities
- Industrial Boilers[b]
- Institutional/Commercial Boilers[b]
- Process Heaters
- Stationary Internal Combustion Engines[b]
- Stationary Turbines[b]

Non-Ferrous Metals Processing

Category Name
- Primary Aluminum Production
- Secondary Aluminum Production
- Primary Cooper Smelting
- Primary Lead Smelting
- Secondary Lead Smelting
- Lead Acid Battery Manufacturing
- Primary Magnesium Refining

Ferrous Metals Processing

Category Name
- Coke By-Product Plants
- Coke Ovens: Charging, Top Side, and Door Leaks
- Coke Ovens: Pushing, Quencing, and Battery Stacks
- Ferroalloys Production
- Integrated Iron and Steel Manufacturing
- Non-Stainless Steel Manufacturing - Electric Arc Furnace (EAF) Operation
- Stainless Steel Manufacturing-Electric Arc Furnace (EAF) Operation
- Iron Foundries
- Steel Foundries
- Steel Pickling-HCI Process

Mineral Products Processing

Category Name
- Alumina Processing
- Asphalt/Coal Tar Application-Metal Pipes

Asphalt Concrete Manufacturing
Asphalt Processing
Asphalt Roofing Manufacturing
Chromium Refractories Production
Clay Products Manufacturing
Lime Manufacturing
Mineral Wood Production
Portland Cement Manufacturing
Taconite Iron Ore Processing
Wool Fiberglass Manufacturing

Petroleum and Natural Gas Production and Refining

Category Name
Oil and Natural Gas Production
Petroleum Refineries-Catalytic Cracking (Fluid and other) Units, Catalytic Reforming Units, and Sulfur Plant Units
Petroleum Refineries-Other Sources Not Distinctly Listed

Liquids Distribution

Category Name
Gasoline Distribution (Stage 1)
Organic Liquids Distribution (Non-Gasoline)

Surface Coating Processes

Category Name
Aerospace Industries
Auto and Light Duty Truck (Surface Coating)
Flat Woods Paneling (Surface Coating)
Large Appliances (Surface Coating)
Magnetic Tapes (Surface Coating)
Manufacture of Paints Coatings, and Adhesives
Metal Can (Surface Coating)
Metal Coil (Surface Coating)
Metal Furniture (Surface Coating)
Miscellaneous Metal Parts and Products (Surface Coating)
Paper and Other Webs (Surface Coating)
Plastic Parts and Products (Surface Coating)
Printing Coating, and Dyeing of Fabrics
Printing/Publishing (Surface Coating)
Shipbuilding and Ship Repair (Surface Coating)
Wood Furniture (Surface Coating)

Waste Treatment and Disposal

Category Name
- Hazardous Waste Incineration
- Municipal Landfills
- Sewage Sludge Incineration
- Site Remediation
- Solid Waste Treatment, Storage and Disposal Facilities (TSDF)
- Publicly Owned Treatment Works (POTW) Emissions

Agricultural Chemicals Production

Category Name
- 2.4-D Salts and Esters Production
- 4-Chloro-2-Methylphenoxyacetic Acid Production
- 4.6-Dinitro-o-Cresol Production
- Captafol Production
- Captan Production
- Chloroneb Production
- Chlorothalonil Production
- Dacthal (tm) Production
- Sodium Pentachlorophenate Production
- Tordon (tm) Acid Production

Fibers Production Processes

Category Name
- Acrylic Fibers/Modacrylic Fibers Production
- Rayon Production
- Spandex Production

Food and Agricultural Processes

Category Name
- Baker's Yeast Manufacturing
- Cellulose Food Casing Manufacturing
- Vegetable Oil Production

Pharmaceutical Production Processes

Category Name
- Pharmaceutical Production

Polymers and Resins Production

Category Name
- Acetal Resins Production
- Acrylonitrile-Butadiene-Styrene Production

Alkyd Resins Production
Amino Resins Production
Boat Manufacturing
Butadiene-Furfural Cotrimer (R-11)
Butyl Rubber Production
Carboxymethylcellulose Production
Cellophane Production
Cellulose Ethers Production
Epichlorohydrin Elastomers Production
Epoxy Resins Production
Ethylene-Propylene Elastomers Production
Flexible Polyurethane Foam Production
Hypalon (tm) Production
Maleic Anhydride Copolymers Production
Methylcellulose Production
Methylcellulose Production
Methyl Methacrylate-Acrylonitrile-Butadiene-Styrene Production
Methyl Methacrylate-Butadiene-Styrene Terpolymers Production
Neoprene Production
Nitrile Butadiene Rubber Production
Non-Nylon Polyamides Production
Nylon 6 Production
Phenolic Resins Production
Polybutadiene Rubber Production
Polycarbonates Production
Polyester Resins Production
Polyethylene Teraphthalate Production
Polymerized Vinylidene Chloride Production
Polymethyl Methacrylate Resins Production
Polystyrene Production
Polysulfide Rubber Production
Polyvinyl Acetate Emulsions Production
Polyvinyl Alcohol Production
Polyvinyl Butyral Production
Polyvinyl Chloride and Copolymers Production
Reinforced Plastic Composites Production
Styrene-Acrylonitrile Production
Styrene-Butadiene Rubber and Latex Production

Production of Inorganic Chemicals

Category Name
Ammonium Sulfate Production-Captrolactam By-Product Plants
Antimony Oxides Manufacturing
Chlorine Production
Chromium Chemicals Manufacturing

Cyanuric Chloride Production
Fume Silica Production
Hydrochloric Acid Production
Hydrogen Cyanide Production
Hydrogen Fluoride Production
Phosphate Fertilizers Production
Phosphoric Acid Manufacturing
Quaternary Ammonium Compounds Production
Sodium Cyanide Production
Uranium Hexafluoride Production

Production of Organic Chemicals

Category Name
Synthetic Organic Chemical Manufacturing

Miscellaneous Processes

Category Name
Aerosol Can-Filling Facilities
Benzyltrimethylammonium Chloride Production
Butadiene Dimers Production
Carbonyl Sulfide Production
Chelating Agents Production
Chlorinated Paraffins Production
Chromic Acid Anodizing
Commercial Dry Cleaning (Perchloroethylene) - Transfer Machines
Commercial Sterilization Facilities
Decorative Chromium Electroplating
Dodencanedioic Acid Production
Dry Cleaning (Petroleum Solvent)
Ethylidene Norbornene Production
Explosives Production
Halogenated Solvent Cleaners
Hard Chromium Electroplating
Hydrazine Production
Industrial Dry Cleaning (Perchloroethylene) - Transfer Machines
Industrial Dry Cleaning (Perchloroethylene) - Dry-to-Dry Machines
Industrial Process Cooling Towers
OBPA/1,3-Diisocyanate Production
Paint Stripper Users
Photographic Chemicals Production
Phthalate Plasticizers Production
Plywood/Particle Board Manufacturing

Polyether Polyols Production
Pulp and Paper Production
Rocket Engine Test Firing
Rubber Chemicals Manufacturing
Semiconductor Manufacturing
Symmetrical Tetrachloropyridine Production
Tire Production
Wood Treatment