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Part II

Environmental Protection Agency

40 CFR Part 61

National Emission Standards for
Hazardous Air Pollutants; Benzene; Rule
and Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[AD-FRL-3620-4]

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National Emission Standards for Hazardous Air Pollutants; Benzene Emissions From Maleic Anhydride Plants, Ethylbenzene/Styrene Plants, Benzene Storage Vessels, Benzene Equipment Leaks, and Coke By-Product Recovery Plants

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: On December 8, 1987, the DC Circuit Court granted the EPA's motion for a voluntary remand of the benzene equipment leaks standards and the withdrawal of proposed standards for maleic anhydride and ethylbenzene/styrene (EB/S) process vents and benzene storage vessels in light of the same court's recent decision on the vinyl chloride standards (*Natural Resources Defense Council, Inc. v. EPA*, 824 F.2d at 1146 [1987]) (hereafter referred to as *Vinyl Chloride*). On July 28, 1988 (53 FR 28496), EPA proposed four policy approaches that could be used in setting national emission standards for hazardous air pollutants (NESHAP) under section 112 of the Clean Air Act (CAA), and that would be consistent with the court's decision in *Vinyl Chloride*. The proposal included the application of each of the policy approaches to the four benzene source categories in the remand, plus an additional category, coke by-product recovery plants.

This Federal Register notice announces the EPA's final decision on the policy approach for setting NESHAP that is consistent with the requirements of *Vinyl Chloride*. This notice also promulgates final rules under section 112 for benzene emissions from coke by-product recovery plants (40 CFR part 61 subpart L) and benzene storage vessels (40 CFR part 61 subpart Y); and it presents the EPA's final decisions to require no additional control of benzene equipment leaks beyond the requirements of 40 CFR 61 Subpart J, and not to regulate benzene emissions from EB/S and maleic anhydride process vents. This notice also responds to comments on the proposed policy approaches and the standards proposed under each approach.

EFFECTIVE DATE: September 14, 1989. Under section 307(b)(1) of the CAA, judicial review of NESHAP is available

only by filing a petition for review in the United States Court of Appeals for the District of Columbia Circuit within 60 days of today's publication of these rules. Under section 307(b)(2) of the CAA, the requirements that are the subject of today's notice may not be challenged later in civil or criminal proceedings brought by EPA to enforce these requirements. The incorporation by reference of certain publications in these standards is approved by the Director of the Office of the Federal Register as of September 14, 1989.

ADDRESSES: *Background Information Document.* A background information document (BID) summarizing and responding to legal comments and technical comments on the benzene source categories and risk assessment may be obtained from the U.S. EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone (919) 541-2777. Please refer to "Benzene Emissions from Coke By-Product Recovery Plants, Benzene Storage Vessels, Equipment Leaks, and Ethylbenzene/Styrene Process Vents—Background Information and Responses to Technical Comments for 1989 Final Decisions," (Publication No. EPA-450/3-89-31).

Dockets. Docket No. OAQPS 79-3 (Part I) contains information considered in determining health effects, listing, and regulating benzene and general public comments on the proposed policy approaches. Docket No. A-79-16 contains supporting information used in the development of the standards for coke by-product recovery plants, Docket No. A-79-27 contains supporting information used in the development of the standards for benzene equipment leaks, Docket No. A-80-14 contains supporting information used in the development of the standards for benzene storage vessels, and Docket Nos. OAQPS 79-3 (Part II) and A-79-49 contain supporting information on maleic anhydride process vents and EB/S process vents, respectively. These dockets are available for public inspection and copying between 8:00 a.m. and 3:30 p.m., Monday through Friday, at the EPA's Air Docket, Room M-1500, First Floor, Waterside Mall, 401 M Street, SW., Washington, DC. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: For information specific to coke by-product recovery plants or benzene storage vessels, contact Ms. Gail Lacy at (919) 541-5261, Standards Development Branch, Emission Standards Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North

Carolina 27711. For information specific to benzene equipment leaks, EB/S process vents, or maleic anhydride process vents, contact Dr. Janet Meyer, at the above address, telephone number (919) 541-5254. For information concerning the general policy contained in this notice, contact Mr. Fred Dimmick, at the above address, telephone number (919) 541-5625. For information concerning the health effects of benzene and the risk assessment, contact Mr. Robert Kellam at (919) 541-5647, Pollutant Assessment Branch, Emission Standards Division (MD-13), at the above address.

SUPPLEMENTARY INFORMATION: The information presented in this preamble is organized as follows:

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I. Summary of Decisions

Overview

This section provides a description of the EPA's approach for the protection of public health under section 112. In protecting public health with an ample margin of safety under section 112, EPA strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than

approximately 1 in 1 million and (2) limiting to no higher than approximately 1 in 10 thousand the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years. Implementation of these goals is by means of a two-step standard-setting approach, with an analytical first step to determine an "acceptable risk" that considers all health information, including risk estimation uncertainty, and includes a presumptive limit on maximum individual lifetime risk (MIR) of approximately 1 in 10 thousand. A second step follows in which the actual standard is set at a level that provides "an ample margin of safety" in consideration of all health information, including the number of persons at risk levels higher than approximately 1 in 1 million, as well as other relevant factors including costs and economic impacts, technological feasibility, and other factors relevant to each particular decision. Applying this approach to the five benzene source categories in today's notice results in controls that protect over 99 percent of the persons within 50 kilometers (km) of these sources at risk levels no higher than approximately 1 in 1 million.

A principle that accompanies these numerical goals is that while the Agency can establish them as fixed numbers, the state of the art of risk assessment does not enable numerical risk estimates to be made with comparable confidence. Therefore, judgment must be used in deciding how numerical risk estimates are considered with respect to these goals. As discussed below, uncertainties arising from such factors as the lack of knowledge about the biology of cancer causation and gaps in data must be weighed along with other public health considerations. Many of the factors are not the same for different pollutants, or for different source categories.

Background

On July 28, 1988, EPA proposed decisions on standards under Section 112 for five source categories of benzene. A principal aspect of the proposal, and the basis for the proposed decisions on the source categories, were four proposed approaches for decisions under Section 112 as mandated by the DC Circuit's decision in *NRDC v. EPA*, 824 F.2d at 1146 (1987) (the "*Vinyl Chloride*" decision). The *Vinyl Chloride* decision required the Administrator to exercise his judgment under Section 112 in two steps: first, a determination of a "safe" or "acceptable" level of risk considering only health factors, followed by a second step to set a standard that provides an "ample margin of safety", in

which costs, feasibility, and other relevant factors in addition to health may be considered.

The four proposed approaches were designed to provide for consideration of a variety of health risk measures and information in the first step analysis under the *Vinyl Chloride* decision—the determination of "acceptable risk." Included in the alternative approaches were three that consider only a single health risk measure in the first step: (1) Approach B, which considers only total cancer incidence with 1 case per year (case/year) as the limit for acceptability; (2) Approach C, which considers only the maximum individual risk ("MIR") with a limit of 1 in 10 thousand for acceptability; and (3) Approach D, which considers only the maximum individual risk with 1 in 1 million as the limit. The fourth approach, Approach A, was a case-by-case approach that considers all health risk measures, the uncertainties associated with them, and other health information.

In the second step, setting an "ample margin of safety", each of the four approaches would consider all health risk and other information, uncertainties associated with the health estimates, as well as costs, feasibility, and other factors which may be relevant in particular cases. The proposal solicited comment on each of the approaches as well as other approaches for implementing the *Vinyl Chloride* decision (53 FR 28511-28532). The Agency received many public comments on the approaches from citizen's groups, companies and industry trade groups, State and local governments, and individuals. Most of the comments supported either Approach A or D, with little comment in support of Approach B or C.

Selection of Approach

Based on the comments and the record developed in the rulemaking, EPA has selected an approach, based on Approaches A and C but also incorporating consideration of incidence from Approach B and consideration of health protection for the general population on the order of 1 in 1 million from Approach D. Thus, in the first step of the *Vinyl Chloride* inquiry, EPA will consider the extent of the estimated risk were an individual exposed to the maximum level of a pollutant for a lifetime ("MIR"). The EPA will generally presume that if the risk to that individual is no higher than approximately 1 in 10 thousand, that risk level is considered acceptable and EPA then considers the other health and risk factors to complete an overall judgment on acceptability. The

presumptive level provides a benchmark for judging the acceptability of maximum individual risk ("MIR"), but does not constitute a rigid line for making that determination.

The Agency recognizes that consideration of maximum individual risk ("MIR")—the estimated risk of contracting cancer following a lifetime exposure at the maximum, modeled long-term ambient concentration of a pollutant—must take into account the strengths and weaknesses of this measure of risk. It is an estimate of the upperbound of risk based on conservative assumptions, such as continuous exposure for 24 hours per day for 70 years. As such, it does not necessarily reflect the true risk, but displays a conservative risk level which is an upperbound that is unlikely to be exceeded. The Administrator believes that an MIR of approximately 1 in 10 thousand should ordinarily be the upper end of the range of acceptability. As risks increase above this benchmark, they become presumptively less acceptable under section 112, and would be weighed with the other health risk measures and information in making an overall judgment on acceptability. Or, the Agency may find, in a particular case, that a risk that includes MIR less than the presumptively acceptable level is unacceptable in the light of other health risk factors.

In establishing a presumption for MIR, rather than a rigid line for acceptability, the Agency intends to weigh it with a series of other health measures and factors. These include the overall incidence of cancer or other serious health effects within the exposed population, the numbers of persons exposed within each individual lifetime risk range and associated incidence within, typically, a 50 km exposure radius around facilities, the science policy assumptions and estimation uncertainties associated with the risk measures, weight of the scientific evidence for human health effects, other quantified or unquantified health effects, effects due to co-location of facilities, and co-emission of pollutants.

The EPA also considers incidence (the numbers of persons estimated to suffer cancer or other serious health effects as a result of exposure to a pollutant) to be an important measure of the health risk to the exposed population. Incidence measures the extent of health risk to the exposed population as a whole, by providing an estimate of the occurrence of cancer or other serious health effects in the exposed population. The EPA believes that even if the MIR is low, the overall risk may be unacceptable if

significant numbers of persons are exposed to a hazardous air pollutant, resulting in a significant estimated incidence. Consideration of this factor would not be reduced to a specific limit or range, such as the 1 case/year limit included in proposed Approach B, but estimated incidence would be weighed along with other health risk information in judging acceptability.

The limitations of MIR and incidence are put into perspective by considering how these risks are distributed within the exposed population. This information includes both individual risk, including the number of persons exposed within each risk range, as well as the incidence associated with the persons exposed within each risk range. In this manner, the distribution provides an array of information on individual risk and incidence for the exposed population.

Particular attention will also be accorded to the weight of evidence presented in the risk assessment of potential human carcinogenicity or other health effects of a pollutant. While the same numerical risk may be estimated for an exposure to a pollutant judged to be a known human carcinogen, and to a pollutant considered a possible human carcinogen based on limited animal test data, the same weight cannot be accorded to both estimates. In considering the potential public health effects of the two pollutants, the Agency's judgment on acceptability, including the MIR, will be influenced by the greater weight of evidence for the known human carcinogen.

In the *Vinyl Chloride* decision, the Administrator is directed to determine a "safe" or "acceptable" risk level, based on a judgment of "what risks are acceptable in the world in which we live." 824 F.2d at 1165. To aid in this inquiry, the Agency compiled and presented a "Survey of Societal Risk" in its July 1988 proposal (53 FR 28512-28513). As described there, the survey developed information to place risk estimates in perspective, and to provide background and context for the Administrator's judgment on the acceptability of risks "in the world in which we live." Individual risk levels in the survey ranged from 10^{-1} to 10^{-7} (that is, the lifetime risk of premature death ranged from 1 in 10 to 1 in 10 million), and incidence levels ranged from less than 1 case/year to estimates as high as 5,000 to 20,000 cases/year. The EPA concluded from the survey that no specific factor in isolation could be identified as defining acceptability under all circumstances, and that the acceptability of a risk depends on

consideration of a variety of factors and conditions. However, the presumptive level established for MIR of approximately 1 in 10 thousand is within the range for individual risk in the survey, and provides health protection at a level lower than many other risks common "in the world in which we live." And, this presumptive level also comports with many previous health risk decisions by EPA premised on controlling maximum individual risks to approximately 1 in 10 thousand and below.

In today's decision, EPA has selected an approach based on the judgment that the first step judgment on acceptability cannot be reduced to any single factor. The EPA believes that the level of the MIR, the distribution of risks in the exposed population, incidence, the science policy assumptions and uncertainties associated with the risk measures, and the weight of evidence that a pollutant is harmful to health are all important factors to be considered in the acceptability judgment. The EPA concludes that the approach selected best incorporates all of this vital health information, and enables it to weigh them appropriately in making a judgment. In contrast, the single measure Approaches B, C, and D, while providing simple decisionmaking criteria, provide an incomplete set of health information for decisions under section 112. The Administrator believes that the acceptability of risk under section 112 is best judged on the basis of a broad set of health risk measures and information. As applied in practice, the EPA's approach is more protective of public health than any single factor approach. In the case of the benzene sources regulated here, more than 99 percent of the population living within 50 km would be exposed to risks no greater than approximately 1 in 1 million; and, the total number of cases of death or disease estimated to result would be kept low.

Under the two-step process specified in the *Vinyl Chloride* decision, the second step determines an "ample margin of safety," the level at which the standard is set. This is the important step of the standard-setting process at which the actual level of public health protection is established. The first step—consideration of acceptability—is only a starting point for the analysis, in which a floor for the ultimate standard is set. The standard set at the second step is the legally enforceable limit that must be met by a regulated facility.

Even though the risks judged "acceptable" by EPA in the first step of the *Vinyl Chloride* inquiry are already

low, the second step of the inquiry, determining an "ample margin of safety," again includes consideration of all of the health factors, and whether to reduce the risks even further. In the second step, EPA strives to provide protection to the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1 in 1 million. In the ample margin decision, the Agency again considers all of the health risk and other health information considered in the first step. Beyond that information, additional factors relating to the appropriate level of control will also be considered, including costs and economic impacts of controls, technological feasibility, uncertainties, and any other relevant factors. Considering all of these factors, the Agency will establish the standard at a level that provides an ample margin of safety to protect the public health, as required by section 112. Application of this approach to the five source categories under consideration in this rulemaking is summarized in the following discussions.

Maleic Anhydride Process Vents

Summary of Decision: Benzene is no longer used in the manufacture of maleic anhydride because all plants in the industry have converted their process equipment to the more economical n-butane feed process. Thus, all benzene exposure from this industry has been eliminated, and no Federal regulation is needed. Maleic anhydride plants are, therefore, not discussed in the remaining sections of this notice.

Ethylbenzene/Styrene Process Vents

Summary of Decision: The existing level of control is judged to provide an ample margin of safety. Under existing State requirements, overall current emissions have been reduced 98 percent or more from uncontrolled levels. The present level of emissions are estimated to present an MIR of 2 in 100 thousand and a total nationwide incidence of about 1 case every 300 years (0.003 case/year). Levels of benzene reported to produce noncancer health effects are at least three orders of magnitude above the exposures comparable to the MIR.

Most people exposed to benzene from these sources are exposed to very low risk levels. Specifically, the risk estimates show: (1) About 600 people are exposed to risk levels of about 1 in 100 thousand reflecting 1 cancer case every 5,000 years (0.0002 case/year) and (2) at least 90 percent of the population modeled to 20 km (about 400,000 people) is exposed to risk levels of less than 1 in

1 million, reflecting about 1 cancer case every 300 years (0.003 case/year). It is anticipated that if modeling were conducted to a 50 km radius, the percentage of the exposed population at risks of less than 1 in 1 million would be at least 99. Further reductions would provide only negligible additional risk and emission reductions (less than 1 percent additional control) and would cost approximately \$0.2 million per year (1982 dollars), which would be about the same in 1988 dollars.

Benzene Storage Vessels

Summary of Decision: In providing an ample margin of safety for this source category, the final standards require effective controls on storage vessels not already controlled. The final standards would reduce nationwide benzene emissions by an estimated additional 20 to 60 percent beyond the baseline level, which already includes emission reductions for most storage vessels. The MIR after application of the standards is estimated to be 3 in 100 thousand. This reflects a reduction from an MIR range of between 4 in 100 thousand and 4 in 10 thousand without the standards. The estimated cancer incidence would be reduced from the range without the standards of 1 case every 10 to 20 years (0.1 to 0.05 case/year) to 1 case every 25 years (0.04 case/year). Levels of benzene reported to produce noncancer health effects are at least three orders of magnitude above the exposure level after an ample margin of safety is provided by EPA.

Most people exposed to benzene from this source category would be exposed to very low levels. The standards are estimated to result in an emission level where: (1) No people are exposed to a risk level greater than 1 in 10 thousand, (2) about 100,000 people would be exposed to a risk level between 3 in 100 thousand and 1 in 1 million, and (3) a majority of the modeled population (70 million people, or greater than 99 percent) is exposed to a risk level of less than 1 in 1 million. While EPA was unable to estimate the cancer incidences associated with various risk levels for this source category, the cancer incidences for the higher risk levels would occur very infrequently and for the lower risk levels would occur about once every 25 years (0.04 case/year). To reduce these exposures further, the next most effective level of control would cost an additional estimated \$1.2 million per year (1982 dollars) or roughly \$1.3 million in 1988 dollars, but it was not chosen because it would not reduce the MIR and would reduce the cancer incidence by only 1 case every 100 years (0.01 case/year).

Summary of the Standards: The final standards require control of all new and existing vessels with capacities greater than or equal to 38 cubic meters (m^3) (10,000 gallons) used to store benzene. The standards do not apply to storage vessels used for storing benzene at coke by-product recovery facilities because they are considered under the coke by-product recovery plant standards. The standards require use of certain kinds of equipment and work practices for each type of benzene storage vessel. The standards require the use of internal floating roofs (IFR's) with continuous primary seals on fixed roof vessels, and improvements to fittings (e.g., gaskets). For external floating roof (EFR) vessels, secondary seals are required. The standards also require periodic inspections of the vessel roofs, seals, and fittings. Detailed summaries of the regulation and changes since proposal are contained in sections IV and V of this notice.

Coke By-Product Recovery Plants

Summary of Decision: In providing an ample margin of safety for this source category, the final standards reduce benzene emissions by about 97 percent for affected facilities nationwide. The MIR after application of the standards is estimated to be 2 in 10 thousand and the cancer incidence is about 1 cancer incidence every 20 years (0.05 case/year). This reflects significant risk reduction from the MIR of 7 in 1 thousand and the cancer incidence of 1 cancer incidence every 6 months (about 2 case/year) that are estimated to occur without the standards. Given estimating uncertainties in this case, the MIR level after the standards is comparable to the EPA's benchmark of approximately 1 in 10 thousand. As discussed in Section III of this preamble, EPA views this level as an overstatement of the actual MIR because the emission estimates associated with this level are likely to be overstated. Levels of benzene reported to produce noncancer health effects are at least three orders of magnitude above the exposure level expected after an ample margin of safety is provided by EPA.

Most people exposed to benzene from this source category would be exposed to very low levels. The standards reduce emissions to a level where: (1) Approximately 100 people would be exposed to a risk level between the estimated MIR and about 1 in 10 thousand reflecting about 1 cancer incidence every 5,000 years (0.0002 case/year), (2) about 300,000 people would be exposed to a risk level between 1 in 10 thousand and 1 in 1 million reflecting about 1 cancer

incidence every 100 years (0.01 case/year), and (3) a majority of the modeled population (70 million people, or greater than 99 percent) would be exposed to a risk level of less than 1 in 1 million, reflecting about 1 cancer incidence every 25 years (0.04 case/year). To reduce these exposures to the level associated with the next most effective level of control would cost an additional estimated \$6 million per year (1984 dollars), which would be roughly \$6.6 million in 1988 dollars. Furthermore, it would involve the use of a control technology that may not be technically feasible, and would only provide a small overall risk reduction of about 1 percent, reflecting an estimated cancer incidence of 1 in every 33 years (0.03 case/year). Additionally, there would be no change in the MIR of about 2 in 10 thousand.

Summary of Standards: The final standards require that process vessels and tar storage tanks in furnace and foundry coke by-product recovery plants be enclosed and the emissions ducted to an enclosed point in the by-product recovery process where they will be recovered or destroyed. This requirement is based on the use of a gas blanketing system. The same requirements also apply to storage tanks for benzene, benzene-toluene-xylene (BTX) mixtures, and light oil in furnace coke by-product recovery plants. To ensure proper operation and maintenance of the system, the standards require semiannual visual inspections and monitoring to detect and repair leaks as well as annual maintenance inspections. The final standards also require that light-oil sumps be completely enclosed; this requirement is based on the use of a permanent or removable cover equipped with a gasket. Semiannual visual inspections and monitoring for leak detection and repair are also required for this source.

The final standards establish a zero emissions limit applicable to naphthalene processing, final coolers, and the associated final-cooler cooling towers at both furnace and foundry plants. The limit is based on the use of a wash-oil final cooler, although other types of systems that achieve the emissions limit can also be used.

The final standards also contain provisions for the control of equipment in benzene service, including pumps, valves, exhausters, pressure-relief devices, sampling connections, and open-ended lines. The leak detection and repair requirements are the same as the requirements in 40 CFR 61 subpart V, and additionally include quarterly leak detection and repair requirements

for exhausters. A detailed summary of the regulation can be found in section V of this notice.

Benzene Equipment Leaks

Summary of Decision: The existing standards for this source category (Subpart J of part 61) are judged to provide an ample margin of safety, especially considering the overstatement of emissions. When these standards were issued in 1984, EPA estimated it would reduce emissions by about 70 percent from the level that would occur without the standards. Using these emission estimates (which overstate emissions as discussed in the next paragraph), the MIR was estimated to be 6 in 10 thousand and the incidence was estimated to be 1 case every 5 years (0.2 case/year).

Based on information received in the past year, EPA considers the present level of emissions associated with the existing standards to be substantially lower than previously estimated. Thus the available risk estimates are substantially overstated. The EPA has reached this conclusion after reviewing information demonstrating compliance with the existing standards and new information about emissions from equipment leaks. However, because the changes in the control of equipment leaks, especially leaks of air toxics, and the changes in the analytical tools needed for determining emissions from these sources have occurred very recently, EPA has not been able to develop better estimates of benzene emissions from equipment leaks. If EPA were to roughly estimate emissions based on this information, the resulting MIR would be comparable to the benchmark of approximately 1 in 10,000. (This is discussed further in sections III and IV of this preamble). Levels of benzene reported to produce noncancer health effects are at least three orders of magnitude above current levels of exposure.

Most people exposed to benzene emissions from this source category are exposed to very low risk levels. Even at the estimated emission levels, the existing standards result in: (1) About 1 million people at a level between 1 in 10,000 and 1 in 1 million with an incidence of 1 case every 25 years (0.04 case/year) and (2) the vast majority of the modeled population (200 million people or greater than 99 percent) is exposed at risks of less than 1 in 1 million with an incidence of 1 case every 5 years (0.2 case/year). If the actual emission rates were known, the exposures would be lower than these estimates. To reduce these exposures further to the next most effective level of emission control would require the use of control technologies that may not be

technically feasible at an estimated cost of \$52.4 million per year (1979 dollars), which would be roughly \$75 million in 1988 dollars.

II. Background

Regulatory Background

In 1977, the Administrator announced his decision to list benzene as a hazardous air pollutant under section 112 of the CAA (42 FR 29332, June 8, 1977). Benzene was determined to be a hazardous air pollutant because of its carcinogenic properties, evidenced by elevated leukemia incidence in populations occupationally exposed. Detailed information about the hazard identification, dose/response assessment, exposure assessment and risk characterization for benzene were presented in the preamble to the policy approaches and standards proposed in July 1988 (53 FR 28496), and will not be repeated in today's notice.

The listing of benzene as a hazardous air pollutant was followed by proposal of standards for benzene emissions from maleic anhydride process vents, EB/S process vents, benzene storage vessels, and benzene equipment leaks in 1980 and 1981 (45 FR 26660, April 18, 1980; 45 FR 83448, December 18, 1980; 45 FR 83952, December 19, 1980; and 46 FR 1165, January 5, 1981). On June 6, 1984, after receipt of comments from industry and members of the public, EPA published a final rule setting emission standards for benzene equipment leaks (49 FR 23498) and published proposed standards for benzene emissions from coke by-product recovery plants (49 FR 23522). On that date, EPA also withdrew its proposed standards for maleic anhydride process vents, EB/S process vents, and benzene storage vessels (49 FR 23558). The withdrawal was based on the conclusion that both the benzene health risks to the public from these three source categories, and the potential reductions in health risks achievable with available control techniques were too small to warrant Federal regulatory action under section 112 of the CAA.

On August 3, 1984, the Natural Resources Defense Council (NRDC) filed a petition for review in the United States Court of Appeals for the District of Columbia Circuit, seeking review of the EPA's three withdrawals of proposed benzene emission standards, and the EPA's final standards for benzene equipment leaks (*Natural Resources Defense Council, Inc. v. Thomas*, No. 84-1387). On October 17, 1984, NRDC petitioned EPA under section 307(d)(7)(B) of the CAA to reconsider its decisions to withdraw standards for maleic anhydride process vents, EB/S process vents, and benzene storage vessels, and to reconsider the

promulgated standards for benzene equipment leaks. The EPA denied this petition on August 23, 1985 (50 FR 34144).

On July 28, 1987, the court handed down an *en banc* decision in a case concerning the national emission standards under Section 112 for vinyl chloride (Docket No. OAQPS 79-3, Part I, Item X-I-4). The court concluded in *Vinyl Chloride* that EPA had acted improperly in withdrawing a proposed revision to the standards for vinyl chloride by considering costs and technological feasibility without first determining a "safe" or "acceptable" emission level. In light of the *Vinyl Chloride* opinion, EPA requested a voluntary remand to reconsider its June 6, 1984, benzene decisions. In an order dated December 8, 1987, the court granted the EPA's motion and established a schedule under which EPA was to propose its action on reconsideration within 180 days of the order and take final action within 360 days of the order. This order was subsequently modified to extend the time for proposal by 45 days and then to establish August 31, 1989, as the deadline for final action. The EPA also decided to reconsider the proposed standards for benzene emissions from coke by-product recovery plants in light of the *Vinyl Chloride* decision and to publish a supplemental proposal. All of these actions were proposed on July 28, 1988 (53 FR 28496).

Public Participation

A public hearing was held in Washington, DC, on September 1, 1988, and was attended by about 90 people. Oral testimony was presented by 12 organizations and individuals. The public comment period closed on October 3, 1988, with over 200 comments received among the four dockets. The public comment period was reopened from December 15, 1988, to January 30, 1989, based on the EPA's review of the comments and the number of requests for an extension of the comment period. Additional comments were received, raising the combined number of comments to more than 275.

Legal Framework Under Vinyl Chloride

The EPA considers the *Vinyl Chloride* decision to further define the legal framework for setting NESHAP under Section 112 of the CAA. The court set out a two-step process for EPA to follow in making these judgments: first, determine a "safe" or "acceptable risk" level, and then set standards at the level—which may be equal to or lower, but not higher than, the "safe" or "acceptable" level—that protects public health with an ample margin of safety. It

should be noted that the *Vinyl Chloride* court acknowledged that EPA could employ a single step analysis under certain circumstances provided cost and feasibility were excluded from consideration. *Vinyl Chloride*, 824 F.2d at 1165, n.11.

In *Vinyl Chloride*, the court acknowledged that judgments by EPA concerning scientific uncertainty are a relevant part of the process for establishing NESHAP. As the court noted, Congress, in directing EPA to set NESHAP, recognized that uncertainties over the health effects of the pollutants complicate the task. *Vinyl Chloride*, 824 F.2d at 1152. These same uncertainties, according to the court, mean that the Administrator's "decision in this area 'will depend to a greater extent upon policy judgments' to which we must accord considerable deference." *Id.*, 824 F.2d at 1162 (citations omitted).

"Safe" or "Acceptable" Level: The first step is for the Administrator to determine what level of risk to health caused by emissions of a hazardous air pollutant is "safe" or "acceptable." (The court used these terms interchangeably.) The court in *Vinyl Chloride* explicitly declined to determine what risk level is "acceptable" or to set out the method for determining the "acceptable risk" level. Instead, the court stated that these determinations are within the Administrator's discretion.

The court did, however, provide some guidance on the "safe" or "acceptable risk" determination. To make this judgment, "the Administrator must determine what inferences should be drawn from available scientific data and decide what risks are acceptable in the world in which we live." *Id.*, at 1165. However, the court emphasized that "safe" does not require elimination of all risk. To support these propositions, the court cited *Industrial Union Dept., AFL-CIO v. American Petroleum Inst.*, 448 U.S. 607, 642 (1980) and its statement that "[t]here are many activities that we engage in every day—such as driving a car or even breathing city air—that entail some risk of accident or material health impairment; nevertheless, few people would consider those activities 'unsafe'." *Vinyl Chloride*, 824 F.2d at 1165. As a final matter, the court said that the Administrator cannot consider costs or technological feasibility in this step.

Ample Margin of Safety: Once an "acceptable risk" level is determined, the second step under *Vinyl Chloride* is to determine whether the emission levels accompanying that determination should be reduced further in providing an "ample margin of safety." Noting that the purpose of the ample margin of

safety requirement is to protect against incompletely understood dangers, uncertainties, and variabilities, the court stated that EPA "may . . . decide to set the level below that previously determined to be safe." The court reiterated that because the assessment of risk is uncertain, "the Administrator must use his discretion to meet the statutory mandate." The court added that it is at this stage of the standards-setting process that EPA may consider costs and technological feasibility and other relevant factors: "Because consideration of these factors at this stage is clearly intended to 'protect the public health,' it is fully consistent with the Administrator's mandate under section 112." *Vinyl Chloride*, 824 F.2d at 1165.

Uniqueness of Decision: The effect of the *Vinyl Chloride* decision is to require a decisionmaking process for public health protection decisions unique to section 112, and unlike any other regulatory decision faced by EPA. This is the result of the court's prescription of two separate steps for decisionmaking, the first in which only health factors can be considered in setting an acceptable risk level, and the second in which additional factors including cost, technological feasibility, and other relevant factors may be considered in providing an ample margin of safety. This scheme is unlike any other under the CAA itself, or any of the other statutes administered by EPA because the acceptable risk that EPA adopts in the first step cannot be exceeded by the standards EPA adopts in the second step. Thus, the EPA's approach to regulating hazardous air pollutants under section 112 is not applicable to regulatory decisions under other statutes or other sections of the CAA. Regulatory decisions under other statutes or other sections of the CAA will continue to be made using individual deliberative processes pursuant to those distinct statutory mandates.

In contrast to section 112, other EPA statutes have very different structures and legal requirements for decisionmaking on public health standards. For example, while the Safe Drinking Water Act provides for two separate decisions, the first is a purely health-based goal toward which to work, but not necessarily meet; the second is an enforceable standard that is based on cost and feasibility considerations. Under both the Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the balancing of health concerns and benefits of continued chemical use, and control

costs are explicitly provided for in decisionmaking. The Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act both require statutory decisionmaking very different from the bifurcated process mandated by the court for Section 112.

Prior to issuance of *Vinyl Chloride* decision by the DC Circuit Court, the EPA's recent judgments under section 112 were made in integrated approaches that considered a range of health and risk factors, as well as cost and feasibility in certain cases. However, the *Vinyl Chloride* decision has required a change in the EPA's approach to section 112, since the previously employed integrated approaches did not partition consideration of health factors into a first step separate from consideration of the other relevant factors. Thus, the *Vinyl Chloride* decision requires EPA to consider whether a risk is acceptable *without* at the same time considering benefits of the activity causing risk, feasibility of control, or other factors that EPA (or anyone) would normally consider in determining whether a risk was "acceptable."

III. Application of Policy to Benzene Source Categories.

Introduction

This section of the preamble explains the application of the EPA's policy for the regulation of the benzene source categories discussed in the July 28, 1988, proposal (53 FR 28496). For each source category, the following are provided: (1) Background information particularly noting any changes to the EPA's risk assessment since the July 1988 proposal, (2) the decision on the acceptable risk noting the health-related factors and uncertainties associated with the EPA's decision, and (3) the decision on the ample margin of safety noting health-related impacts, technological feasibility, and cost information associated with this decision. For those sources for which EPA made decisions that result in additional regulatory requirements, the requirements are explained in Section V of this notice.

Ethylbenzene/Styrene Process Vents

Background: This source category covers process vents of plants manufacturing ethylbenzene, styrene, or both. (Benzene emissions from equipment leaks and storage vessels at EB/S plants have been considered separately and are not included in this source category). As of 1985, there were 13 plants in this source category.

Information received during the public comment period indicates that emissions have declined since 1985 and emissions are now estimated to be 135 megagrams per year (Mg/yr) or less.

Decision on Acceptable Risk: The baseline MIR of 2×10^{-5} is below the presumptive benchmark of approximately 1×10^{-4} (which is 1 in 10 thousand expressed in scientific notation). In estimating these risk levels, EPA has not found that co-location of EB/S plants significantly influences the magnitude of the MIR or other risk levels. The nationwide incidence of cancer from exposure to emissions from these facilities is estimated to be about 1 case every 330 years (0.003 case/year) or lower. The majority (more than 90 percent) of the population within 20 km of these sources is exposed to risk levels lower than 1×10^{-6} . For exposures to risk levels greater than 1×10^{-6} , the incidence is estimated to be 1 case every 10,000 years (0.0001 case/year). Benzene concentrations reported to produce noncancer health effects are at least three orders of magnitude above the exposures predicted from these sources. After considering all these factors, EPA judged the emission level associated with an MIR of 2×10^{-5} is acceptable.

Decision on Ample Margin of Safety: The EPA considered selecting a control level more stringent than the level associated with the acceptable risks. This option would require control of the few remaining uncontrolled intermittent emission sources using 98-percent efficient combustion devices (e.g., boilers and flares). In comparing this control option and the existing level of control, EPA found that they provide essentially the same level of safety. Both control levels reflect a significant reduction in risks and emissions from the uncontrolled level. Control of these sources would further reduce benzene emissions by approximately 70 to 90 Mg/yr at most and would reduce the estimated MIR from 2×10^{-5} to 1×10^{-5} . The annual incidence would be reduced by about 1 case every 500 years (0.002 case/year).

The number of people exposed at risks greater than 1×10^{-6} is essentially the same between these two control levels. For the total population exposed to these sources, the incidence would change from 1 case every 330 years (0.003 case/year) to 1 case every 1,000 years (0.001 case/year). Essentially all (95 percent) of this additional reduction in incidence occurs in the population exposed to risks lower than 1×10^{-6} . The proportion of the population at risk levels below 1×10^{-6} is not changed by this emission reduction. In addition,

benzene concentrations reported to produce noncancer health effects are at least three orders of magnitude above the exposures predicted for these sources.

As noted above, this control option will reduce benzene emissions by 70 to 90 Mg/yr, which represents less than an additional 1 percent reduction over the uncontrolled level. The cost of this additional emission reduction (and consequent risk reduction) would be about \$200,000/yr (1982 dollars). While this additional cost is small, it is disproportionately large in comparison to the small additional emission and risk reduction achieved.

After considering all of these factors, EPA judged that the existing level of controls provides an ample margin of safety. In addition, EPA decided not to set standards to mandate the existing level of controls. Existing controls in the EB/S industry are in the form of product recovery devices or the routing of emissions to the process unit's boilers or other boilers onsite to conserve energy (less fuel would be required due to the energy content of the waste stream). Thus, there is no incentive for removal of existing controls. Additionally, there is no incentive for new sources to waste product or energy, and major new sources would be subject to other EPA requirements (e.g., new source review [NSR], prevention of significant deterioration [PSD]). Thus, less effective controls are not expected in the future. For these reasons, EPA has concluded that Federal standards mandating these controls are not warranted.

Benzene Storage Vessels

Background: This source category covers vessels used to store benzene. These vessels are typically located at petroleum refineries, chemical plants, and bulk storage terminals. As of 1984, 126 facilities with benzene storage vessels had been identified. As noted in the July 28, 1988, Federal Register notice, nationwide baseline (i.e., no NESHAP) emissions from benzene storage vessels are estimated to be about 620 to 1,290 Mg/yr. The range of emissions reflects uncertainty about the presence of shingled seals versus continuous seals on existing vessels with IFR's; the lower end of this range reflects the assumption that all storage vessels have continuous seals, while the upper end is based on the assumption that some vessels (17 percent of the existing IFR vessels) are equipped with shingled seals, which emit more benzene than continuous seals. The baseline incidence associated with these emission estimates is estimated to be 1 case every 10 to 20 years (0.1 to 0.05 case/year). The

baseline MIR ranges from 4×10^{-5} to 4×10^{-4} .

Decision on Acceptable Risk: The baseline MIR (4×10^{-5} to 4×10^{-4}), while ranging above the presumptive risk of approximately 1×10^{-4} , is judged to be within the acceptable range after consideration of the following factors.

First, the upper end of the range (4×10^{-4}) is very likely an overestimate of the MIR because it assumes that all storage vessels have shingled seals at the plants that would also have the highest MIR's if all vessels in the industry had continuous seals. Based on information received from industry in 1978, EPA estimated that 12 percent of the nationwide benzene storage capacity was in vessels with shingled seals. This was estimated to be only about 17 percent of the existing IFR vessels that store benzene. The EPA believes that shingled seals have not been installed on new vessels for the past several years as general industry practice. Accordingly, the number of vessels equipped with shingled seals is decreasing over time; consequently the associated risk is also decreasing as existing vessels are replaced by new vessels. Therefore, the assumption that all vessels in the worst-case plant have shingled seals for the upper end of the MIR range is a unique conservative assumption for this source category. In addition, the emission estimate for storage vessels equipped with shingled seals is overstated for the following reason. The only test series of IFR vessels with shingled seals had testing irregularities, resulting in inaccurately high emission estimates. These test irregularities are described in detail in the EPA document "Benzene Emissions from Benzene Storage Tanks—Background Information for Proposal to Withdraw Proposed Standards" (EPA-450/3-84-004, March 1984). Because there is no way to determine the proportion of emissions attributable to the use of shingled seals versus the test methodology, the emission estimate for shingled-seal vessels continues to reflect all the uncertainty from that test series (49 FR 23563, June 6, 1984). While EPA is unable to quantify these uncertainties, EPA qualitatively considered the effect of these uncertainties (as well as other uncertainties in its risk assessment) in its judgment of acceptability.

Second, even if the MIR were not overestimated, EPA estimated that only 10 people (out of the total modeled population of 70 million) are at risks greater than or equal to 1×10^{-4} , and virtually no cancer incidence is associated with this risk level. In estimating these risk levels, EPA has not

found that co-location of plants significantly influences the magnitude of the MIR or other risk levels. Where two or more of the model plants used for the analysis might occur at one site (e.g., both a producer and a consumer of benzene), the risks were calculated from their total emissions. In addition, EPA estimated that the majority of the people (about 99 percent) exposed to benzene from this source category would be exposed to a risk level of less than 1×10^{-6} , reflecting 1 cancer incidence every 12 years (0.08 case/year), and that 900,000 people would be exposed at a risk level between 1×10^{-4} and 1×10^{-6} , reflecting 1 cancer incidence every 50 years (0.02 case/year). The baseline incidence is estimated to be 1 incidence every 10 to 20 years (0.1 to 0.05 cancer case/year). This range reflects the range of emission estimates (620 to 1,290 Mg/yr). Virtually all of the incidence is associated with the population at a risk of less than 1×10^{-5} . Thus, even though one end of the range of the EPA's MIR estimate for this source category is above 1×10^{-4} , it is important to consider that almost all of the exposure to benzene from storage vessels is associated with risks well below the benchmark of approximately 1×10^{-4} .

The EPA also considered the noncancer health effects associated with benzene exposures at levels comparable to the baseline MIR range. Noncancer health effects have been associated with exposure to benzene, but the levels reported to produce such effects are two to three orders of magnitude above exposures comparable to the MIR range of 4×10^{-5} to 4×10^{-4} , especially with the likely overstatement of the top end of the range.

After considering all these factors, EPA judged that the baseline emission level is acceptable.

Decision on Ample Margin of Safety: The EPA considered selecting a level of emissions more stringent than the level associated with acceptable risk in providing an ample margin of safety for this source category. This would require all vessels to have emission reduction equipment that many vessels already have. Specifically, it would require the use of an IFR with continuous primary seals on each existing fixed roof vessel, and more effective continuous primary seals on any new vessel with an IFR. It would also require improvements to fittings (e.g., gaskets) on the roofs of all IFR vessels. On each vessel with an EFR, this option would require secondary seals. These are similar controls to those that are required for volatile organic liquid (VOL) storage vessels (including benzene vessels) in 40

CFR 60 Subpart Kb, which affects vessels constructed or rebuilt after July 23, 1984. This level of control was labeled Option 2 in the July 28, 1988, proposal (53 FR 28496).

Control Option 2 would reduce the estimated MIR to 3×10^{-5} from the baseline range of 4×10^{-5} to 4×10^{-4} . Because no facility could have vessels with shingled seals, which represent the upper end of the baseline range, all vessels would be required to have continuous seals under the control option and the risks are not expressed as a range. Thus, no one would be potentially exposed to a risk of greater than or equal to 1×10^{-4} . The number of people estimated to be exposed to a risk level between 1×10^{-4} and 1×10^{-6} would be reduced from 900,000 at baseline to 100,000 with this control option. The majority of the modeled exposed population (greater than 99 percent) would be exposed to a risk level less than 1×10^{-6} with Option 2. While EPA was unable to estimate the cancer incidences associated with various risk levels after control to this option for this source category, the cancer incidences for the higher risk levels would occur infrequently, and for the lower levels would occur about once every 25 years (0.04 case/year). Overall, the total nationwide incidence would be reduced from a range of 1 incidence every 10 to 20 years (0.1 to 0.05 case/year) to 1 incidence every 25 years (0.04 case/year). In addition, levels of benzene reported to produce noncancer health effects are at least three orders of magnitude above the levels expected under Option 2.

Control Option 2 would reduce benzene emissions by a range between 20 to 60 percent (110 to 780 Mg/yr) in comparison to the emissions without standards. To achieve this emission reduction (and consequent risk reduction) would cost \$0.1 million/yr (1982 dollars). This cost is considered to be relatively small.

The EPA also considered a more stringent control level, which would require the controls in Option 2 and additionally require secondary seals for IFR vessels (Option 1 in the July 28, 1988, proposal notice, 53 FR 28496). This additional control would not result in any additional reduction in the MIR beyond that achieved by Option 2. The number of people estimated to be exposed to a risk level greater than 1×10^{-6} is estimated to be reduced from 100,000 (Option 2) to 80,000 (Option 1). In both cases, the vast majority of the exposed population (greater than 99 percent) is at a risk of less than 1×10^{-6} . Overall, the total nationwide incidence

would only be reduced from 1 incidence every 25 years (0.04 case/year) for Option 2 to 1 incidence every 33 years (0.03 case/year) for Option 1. This additional incidence reduction is associated mainly with the population exposed to risk levels below 1×10^{-6} . Levels of exposure reported to produce noncancer health effects are at least three orders of magnitude above the levels of exposure expected for Option 1, just as for Option 2. The additional cost of Option 1 over Option 2 would be \$1.2 million/yr (1982 dollars).

Based on the factors discussed above, EPA decided that the level of control reflected by Option 2 provides an ample margin of safety. Although the emissions associated with the baseline risks are considered to be acceptable, they can be reduced further, achieving additional risk reductions, at a reasonable cost using the control technology included in Option 2. Selecting Option 2 also ensures that any existing shingled seals are replaced with continuous seals, thus addressing one of the uncertainties associated with the EPA's risk assessment. In addition, EPA concluded that additional controls beyond Option 2 are not warranted. The costs of additional controls beyond Option 2 are disproportionately high considering the small reductions in risk and incidence which are achievable.

Coke By-Product Recovery Plants

Background: The risk analysis was revised after the July 1988 proposal based on comments that the industry's operating status should be updated. There are now 36 coke by-product recovery plants. The nationwide baseline benzene emissions are estimated to be 17,000 Mg/yr. The revised baseline estimates of health risk indicate an MIR of 7×10^{-3} and an annual cancer incidence of 1 case every 6 months (2 cases/year). More information regarding the updated estimates can be found in Section IV of this preamble and in the BID.

Decision on Acceptable Risk: The baseline risk of 7×10^{-3} is unacceptable for benzene, a known human carcinogen. In considering the decision on acceptable risk for this source category, EPA focused on control to a level that would result in an estimated MIR of 2×10^{-4} . The EPA considers this MIR to be in the acceptable range after considering several factors.

First, the long-term emissions and, therefore, the MIR are likely to be overstated because EPA assumed that coke batteries operate at full capacity for 70 years. In fact, presently not all plants are continuously operating at full

capacity (including some of the plants with the highest risks). In addition, the decline in the domestic coke industry makes it likely that the EPA's estimate overstates the long-term emissions. There is considerable uncertainty in predicting the utilization of coke batteries. Therefore, EPA made the assumption of full capacity for 70 years, recognizing the effect of this assumption (as well as other assumptions) on its risk assessment. Thus, EPA believes the MIR is not likely to be much different than the benchmark of approximately 1×10^{-4} even though EPA is unable to quantify these uncertainties and, therefore, adjust the MIR for this source category. However, EPA considered this likely overestimation qualitatively in its judgment of acceptability. Furthermore, over time, the residual emissions from one group of sources in this category (equipment leaks) may decrease as operators use better equipment (e.g., improved valve packing) in addition to the required work practice program.

Second, EPA estimated that 100 people (out of the total modeled population of 70 million) potentially would be exposed to risks of 1×10^{-4} or greater, with 1 cancer incidence every 5,000 years among this group of 100

people (0.0002 case/year). In estimating these risk levels, EPA has not found that co-location of coke by-product recovery plants significantly influences the magnitude of the MIR or other risk levels. In addition, EPA estimated that the vast majority of the modeled population (greater than 99 percent) exposed to benzene from this source category would be exposed to a risk level of less than 1×10^{-6} reflecting 1 cancer incidence every 25 years (0.04 case/year), and that 300,000 people would be exposed at a risk level between 1×10^{-4} and 1×10^{-6} reflecting 1 cancer incidence every 100 years (0.01 case/year). Of the total cancer incidence (1 cancer incidence every 20 years, i.e., 0.05 case/year), 80 percent is associated with the large population at risks of less than 1×10^{-6} . Thus, even though EPA estimates an MIR of about 2×10^{-4} for this option, it is important to consider that almost all the exposure to benzene from this source category is associated with risks well below the benchmark of approximately 1×10^{-4} .

The EPA also considered the noncancer health effects associated with benzene exposures at levels comparable to an MIR level of 2×10^{-4} . Noncancer health effects have been

associated with exposure to benzene, but the probability is unlikely of the effects occurring at exposures comparable to an MIR level of 2×10^{-4} . Levels of benzene reported to produce such effects are three orders of magnitude higher than the concentrations comparable to an MIR of 2×10^{-4} .

After considering all these factors, EPA judged the emission level associated with an MIR of 2×10^{-4} to be acceptable.

Decision on Ample Margin of Safety: The EPA considered selecting a level of emissions more stringent than the level associated with acceptable risks in providing an ample margin of safety for this source category. This option (Option 1) would require additional control over the acceptable risk level (Option 2) of storage vessels at foundry coke by-product recovery plants and would also require use of dual mechanical seals on pumps and sealed bellows valves (i.e., assumed to be 100 percent control) at both furnace and foundry coke by-product recovery plants. The control technologies and their estimated impacts are presented for each emission point in Table 1 for Options 1 and 2.

TABLE 1. CONTROLS INCLUDED IN EACH OPTION*

Emission points	Control technology efficiency (%)	Option 1		Option 2	
		Furnace	Foundry	Furnace	Foundry
Final cooler, cooling tower; naphthalene processing/handling.....	Wash-oil final cooler (100).....	X	X	X	X
Tar decanter, tar-intercepting sump, and flushing-liquor circulation tank.....	Gas blanketing (98 ^b).....	X	X	X	X
Tar storage and tar-dewatering tanks.....	Gas blanketing (98).....	X	X	X	X
Light-oil condenser, light-oil decanter, wash-oil decanter, and wash-oil circulation tanks.....	Gas blanketing (98).....	X	X	X	X
Excess ammonia-liquor storage tank.....	Gas blanketing (98).....	X	X	X	
Light-oil and BTX storage tanks.....	Gas blanketing (98).....	X	X	X	
Benzene storage tanks.....	N ₂ gas blanketing (98).....	X	X	X	
Light-oil sump.....	Cover (98).....	X	X	X	X
Pumps.....	Monthly inspections (83).....			X	X
	Dual mechanical seals (100).....	X	X		
Valves.....	Monthly inspections (73).....			X	X
	Sealed-bellows valves (100).....	X	X		
Exhausters.....	Quarterly inspections (55).....			X	X
	Degassing reservoir vents (100).....	X	X		
Pressure-relief devices.....	Rupture disc system (100).....	X	X	X	X
Sampling connection systems.....	Closed-purge sampling (100).....	X	X	X	X
Open-ended lines.....	Cap or plug (100).....	X	X	X	X

* The control options analyzed to determine an ample margin of safety are the same as those analyzed for the July 1988 proposal (53 FR 28496), except that control options less stringent than Option 2, the level determined to be in the acceptable range, are not shown on the table. The impacts associated with these control options have been revised since the July 1988 proposal to reflect updated information on the industry operating status. These revisions are explained in greater detail in Section 6 of the BID.

^b 95-percent efficiency for tar decanter.

It should be noted that EPA has not concluded that leakless valves/sealed bellows valves will always effectively eliminate emissions or that they are available for all sizes and types of equipment in benzene service. Nevertheless, EPA evaluated Option 1 to determine if it should be selected to reflect an ample margin of safety even

though there would be technological feasibility issues in implementing this option.

In comparing Options 1 and 2, EPA found that they provide essentially the same level of safety. Each reflects significant risk reduction in comparison to the baseline risks. Although the estimated number of people exposed to

a risk level greater than or equal to 1×10^{-4} would be reduced from 100 to 50 under Option 1, EPA estimates that Option 1 would not reduce the MIR below the Option 2 level of 2×10^{-4} . The number of people exposed to a risk level between 1×10^{-4} and 1×10^{-6} would be reduced from 300,000 to 200,000 under Option 1. Under both options, the vast

majority of the exposed population (greater than 99 percent) would be at risk levels of less than 1×10^{-6} . For the population exposed to a risk level between 1×10^{-4} and 1×10^{-6} , the incidence would change from 1 case every 100 years (0.01 case/year) under Option 2 to 1 case every 140 years (0.007 case/year) under Option 1; for the population exposed to risks below 1×10^{-6} , the incidence would change only from 1 case every 25 years (0.04 case/year) under Option 2 to 1 case every 33 years (0.03 case/year) under Option 1. Overall, the total nationwide incidence would be reduced from 1 case every 20 years (0.05 case/year) to 1 case every 33 years (0.03 case/year) or only by an additional 0.02 case/year. Most (about 80 percent) of this additional reduction in incidence in Option 1 compared to Option 2 occurs in the population exposed to risks in the 1×10^{-6} range or lower. In addition, levels reported to produce noncancer health effects are about three orders of magnitude above levels expected under either option.

Option 1 reduces benzene emissions by about 98 percent, whereas Option 2 reduces benzene emissions by about 97 percent in comparison to the emissions that would occur without the standards. This reflects only an additional 1 percent reduction for Option 1. Also, the relative difference between these options may be even smaller than estimated. This is due to the uncertainty that sealed bellows valves would actually achieve the assumed 100 percent reduction in Option 1 and the potential for higher emission reduction than estimated for the equipment leak detection and repair program under Option 2. To achieve this emission reduction (and consequent risk reduction), Option 1 would increase the annualized cost by about \$6 million/yr (1984 dollars). While this additional cost is relatively small overall, it is disproportionately large in comparison to the small additional emission and health risk reductions associated with Option 1 in comparison to Option 2.

In conclusion, EPA decided that Option 2 provides an ample margin of safety. The EPA judged the risk reductions for Options 1 and 2 to be essentially the same and the greater control cost of Option 1 to be high in relation to the small additional emission and risk reduction achieved. In doing so, EPA considered the likely overstatement of long-term emissions and risks and the question of technical feasibility.

Benzene Equipment Leaks

Background: This source category covers emissions of benzene from pieces

of equipment handling process streams that contain greater than 10 percent benzene, by weight. These equipment pieces include pumps, pipeline valves, open-ended valves, flanges, compressors, pressure-relief valves, sampling connections, process drains, and product accumulator vessels. In 1984, there were an estimated 131 facilities in this source category.

When Subpart J of Part 61, the benzene equipment leaks NESHAP, was promulgated in 1984, EPA estimated that this regulation would reduce emissions from about 7,900 Mg/yr to 2,500 Mg/yr (a 69 percent reduction). As noted in the July 28, 1988, **Federal Register** notice, EPA viewed the estimate of 2,500 Mg/yr for current emissions as being an upperbound estimate, and recognized that actual emissions may be substantially lower. The EPA reached this conclusion after reviewing compliance report information from facilities subject to the existing standards and other information for facilities handling toxic compounds. Information obtained since proposal has further substantiated this conclusion. The basis for this conclusion is summarized below and is discussed in more detail in section IV and in the BID.

During the consideration of the public comments, EPA examined compliance reports from 1987 and 1988 for a randomly-selected sample of 25 facilities subject to the benzene NESHAP. This review showed many facilities had no leaking valves or pumps (0.0 percent) and no facilities had more than 1.5 percent leaking valves. The average leak rate for valves was 0.27 percent. This performance is better than an average expected leak rate of about 3 to 5 percent. In addition to the compliance reports, EPA also reviewed a limited amount of comprehensive data for a few process units with equipment in benzene service. These data show emission rates a factor of 20 to 30 below levels predicted by the earlier EPA studies. However, these more recent results do not provide a basis for developing new emission factors that would be generally applicable to all facilities. To rederive the emission estimates will require additional information and analysis of current industry practices. As this information has been received only recently, EPA has not been able to conduct the necessary studies and analyses in time to revise the emission estimates for benzene equipment leaks. The EPA has initiated a negotiated rulemaking to develop a new regulatory approach that will result in quantifiable emission levels, give credit for good original plant design, and motivate

innovation (54 FR 17944, April 25, 1989). This effort is expected to require at least 6 months to complete. Consequently, the emission and risk estimates remain essentially as presented in the July 28, 1988, **Federal Register** notice.

Decision on Acceptable Risk: Based on 1984 emission estimates, the MIR is estimated to be 6×10^{-4} . However, as discussed previously under "Background" (and as discussed in detail in section IV, in response to comments), EPA considers the emission estimates to be overstated by roughly a factor of 5 to 20, or more. If actual emissions could be quantified and modeled in the exposure analysis, the risk estimates would decrease proportionately to the emissions, and would be comparable to the presumptive risk benchmark. An additional factor in this overstatement of emissions is that the analysis was developed assuming facilities continued to operate at the estimated emission rate for 70 years. However, EPA expects that, over time, emissions may continue to decrease due to improved control of air toxics through use of better design, operation, and maintenance of facilities. Given all these factors, EPA concludes that the MIR for this category is more likely to be less than the benchmark of approximately 1×10^{-4} , and will use this in its judgment on acceptability.

The estimated annual cancer incidence (based on the overstated emission estimates) is 1 case every 5 years (0.2 case/year) in a total modeled population of 200 million. The estimated incidence among the 2,000 people predicted to be at lifetime risks greater than 1×10^{-4} is only 1 case every 200 years (0.005 case/year). In estimating these risk levels, EPA has not found that co-location of facilities significantly influences the magnitude of the MIR. In addition, EPA estimated the majority of the population (greater than 99 percent) exposed to benzene from this source category would be exposed to risk levels below 1×10^{-6} . The incidence predicted for the population exposed to risks smaller than 1×10^{-6} is 1 case every 5 years (0.2 case/year), and the incidence for the population exposed to risks greater than 1×10^{-6} is 1 case every 20 years (0.05 case/year).

The EPA also considered the noncancer health effects associated with benzene exposures at current levels of exposure from this source category. Benzene concentrations reported to produce noncancer health effects are two to three orders of magnitude above the exposures predicted for these sources.

After considering all of these factors, especially the substantial overstatement of emissions, EPA judged that the present, controlled level of emissions and risks are acceptable.

Decision on Ample Margin of Safety: The EPA considered selecting a level of emissions more stringent than the level associated with the existing standards. The additional control of Option 1 reflects the use of dual mechanical seals for pumps, and sealed bellows valves. For the purpose of this analysis, this equipment is considered to be leakless (i.e., 100 percent control). However, it is not known if leakless valves/sealed bellows valves will effectively eliminate emissions or if they are available for all sizes and types of equipment in benzene service. Thus, it should be noted that EPA has not concluded that leakless valves/sealed bellows valves will effectively eliminate leaks. Information is needed on the magnitude of emissions released when a sealed bellows valve fails, failure rates of these valves, and appropriate procedures for monitoring valves for failures before any conclusions are made. In addition, a better understanding of the factors affecting equipment leaks and development of new regulatory approaches is needed before significant further reductions in exposures will be assured. Nevertheless, EPA considered Option 1 to determine if it should be selected to provide an ample margin of safety even though there would be technological feasibility issues in implementing this option.

Under Option 1, the estimated MIR would be reduced by roughly a factor of three, and the nationwide incidence would be reduced from 1 case every 5 years (0.2 case/year) under the current NESHAP baseline to 1 case every 10 years (0.1 case/year). As discussed under the "Decision on Acceptable Risk," EPA views the estimate of the MIR for this source category as significantly overstated. The number of people exposed to a risk level between 1×10^{-4} and 1×10^{-6} would be reduced from about 1 million to 300,000 under Option 1. For the people exposed to these risk levels, the incidence would change from 1 case every 200 years (0.005 case/year) to 1 case every 1,000 years (0.001 case/year) and from 1 case every 25 years (0.04 case/year) to 1 case every 100 years (0.01 case/year), respectively. The number exposed to a risk level less than 1×10^{-6} would be the same under Option 1 and the existing standards, with more than 99.5 percent of the total population of 200 million exposed to these risk levels. Most (about 90 percent) of the additional reduction in

incidence in Option 1 compared to the existing standards would occur in the population exposed to risks in the 1×10^{-6} range or lower. In addition, benzene concentrations reported to produce noncancer health effects are at least two to three orders of magnitude above the concentrations expected under Option 1 or the existing standards.

Option 1 is estimated to reduce benzene emissions by about 50 percent from the level of the standards. The relative difference between the two control levels may be substantially smaller than this estimate. This is due to the uncertainty that sealed bellows valves would actually achieve the assumed 100 percent reduction in Option 1 and the greater than predicted reductions observed with the current standards' leak detection and repair program. Because of the large uncertainty in the emission levels under the current standards, the likely additional emission reduction cannot be estimated. Implementation of the requirements of Option 1 would increase the annualized control cost by \$52.4 million/yr (1979 dollars). (Docket No. A-79-27, Item V-A-1). The majority of the estimated cost is from the cost of sealed bellows valves.

Although Option 1 shows some additional emission and risk reduction may be achievable, the control cost is disproportionately large when compared to the small reductions in risk which could be achieved. If the actual emission reduction were known and used, the option would likely be even less effective. Recognizing the uncertain bias in the emission estimates, the large proportion of the incidence associated with lifetime risks less than 1×10^{-6} , the questions regarding technical feasibility, and the costs of additional controls, EPA judged the emission levels associated with the existing NESHAP to protect public health with an ample margin of safety. Therefore, additional control beyond the existing NESHAP is not warranted and will not be required.

IV. Significant Comments, Responses, and Changes

Legal Comments and Responses

Interpretation of Vinyl Chloride Decision

Comment: Several commenters discussed the fact that the D.C. Circuit Court of Appeals' *Vinyl Chloride* decision recognizes that EPA may deem some level of cancer risk as acceptable, in light of the fact that many carcinogenic substances are assumed not to have a threshold value below which they pose no risk. The issue

raised by these commenters is what level of risk from benzene emissions could be characterized as "acceptable" under the Court of Appeals' ruling, and how acceptable risk relates to the concept of *de minimis* risk particularly as raised in previous court decisions, such as *Alabama Power Co. v. Costle*, 636 F.2d at 323 (D.C. Cir. 1979) and *Public Citizen v. Young*, 831 F.2d at 1108 (D.C. Cir. 1987).

In the context of the *Vinyl Chloride* decision, the issue is whether the "acceptable" risk is equated with *de minimis* risk, and is thereby defined as "trivial" or "of no value," or whether some higher level of risk is considered acceptable under the court's ruling.

One commenter argued that the *Alabama Power* and *Public Citizen* cases support the contention that acceptable risk and *de minimis* risk are synonymous, and that, consequently, only "trivial" risk "of no value" can be interpreted as "acceptable risk" under the *Vinyl Chloride* decision. The commenter asserted that risks cannot be dismissed as "trivial" unless EPA demonstrates a public consensus that the risk levels are unworthy of preventive response. Chemically-induced cancer risks of 6×10^{-3} , 1×10^{-3} , or 1×10^{-4} are not in this category, according to the commenter, and EPA may not be able to show such consensus even for risks of 1×10^{-6} . One commenter also cited *Public Citizen* and *Vinyl Chloride* as support for the position that only a *de minimis* level of risk (e.g., 1×10^{-6} or lower) can be considered acceptable. The commenter noted that this position is consistent with the CAA focus on public health and providing an ample margin of safety.

Four commenters disagreed with the previous commenter. These commenters argued that a safe level is not the equivalent of a *de minimis* risk level and distinguished between *de minimis* risks, which are too trivial to warrant regulation, and a broad zone of higher risks that may still satisfy the court's definition of "acceptable risk." The commenters pointed to the fact that the court used the latter term intentionally in the *Vinyl Chloride* decision, and was aware of the differing legal meaning of *de minimis*. The commenters also cited the *Alabama Power* and *Public Citizen* cases, stating that those decisions held *de minimis* risk to be applicable except for those instances where Congress had already been "extraordinarily rigid" in establishing regulatory requirements.

One commenter also pointed out that the court in the *Vinyl Chloride* decision specifically stated that "acceptable risk"

does not necessarily mean risk free. Instead, the commenter stated, the court defined something as "unsafe" when it exposes humans to a "significant risk of harm." The commenter argued that the fact that a risk is not *de minimis* does not mean that it poses a "significant risk of harm." The commenter also pointed to the examples of "acceptable risk" cited by the court, such as driving a car, which have a higher than *de minimis* risk. Using this example as a guide, the commenter stated that there is no basis for setting "acceptable risk" at a level of 1×10^{-6} since risks significantly above this level may be judged "acceptable" under the *Vinyl Chloride* decision.

Two commenters stated that the "acceptable risk" finding derives directly from the text and legislative history of Section 112 of the CAA, while the *de minimis* concept is a nonstatutory doctrine identified as a risk test by the court in the *Alabama Power* and *Public Citizen* cases. Thus, the "acceptable" and *de minimis* risk tests serve much different functions in public health regulation. One commenter also cited a more recent decision, *Building and Construction Trades Department, AFL-CIO v. Brock*, 838 F.2d 1258 (D.C. Cir. 1988), in which the court held that the Occupational Safety and Health Administration (OSHA) need not consider stricter control measures in the absence of evidence showing that such measures "will provide more than a *de minimis* benefit for worker health." One commenter also cited *Union of Concerned Scientists v. U.S. Nuclear Regulatory Commission*, 824 F.2d 108 (D.C. Cir. 1987), in which the court determined the Nuclear Regulatory Commission (NRC) "need ensure only an acceptable or adequate level of protection of public health and safety" and "not demand that nuclear power plants present no risk of harm."

Response: As the commenters acknowledge, the *Vinyl Chloride* decision recognizes that EPA may find some level of cancer risk to be "acceptable." In its explanation of the term, the court cited the preamble to the **Federal Register** notice announcing the final *Vinyl Chloride* regulations:

Scientific uncertainty, due to the unavailability of dose/response data and the 20-year latency period between initial exposure to vinyl chloride and the occurrence of disease, makes it impossible to establish any definite threshold below which there are no adverse effects to human health. [citation omitted] 824 F.2d 1146 (D.C. Cir. 1987).

The court explained that:

the Congressional mandate to provide "an ample margin of safety" to "protect the public health" requires the Administrator to make an initial determination of what is "safe."

This determination must be based exclusively upon the Administrator's determination of the risk to health at a particular emission level . . . the Administrator's decision does not require a finding that "safe" means "risk free." 824 F.2d at 1164.

Where the commenters differ is over what level of risk from benzene emissions can be considered an "acceptable risk" within the meaning of the *Vinyl Chloride* decision. Some argue that in order to be "acceptable," the risk must be no more than *de minimis* within the meaning of *Alabama Power* and *Public Citizen* while others dispute this position.

The EPA does not interpret "acceptable risk" for purposes of Section 112, as synonymous with or limited to *de minimis* risk as described in *Alabama Power* and *Public Citizen*. The *Vinyl Chloride* decision, while going into great detail in discussing the concepts of both "acceptable risk," and "ample margin of safety," never mentioned the concept of *de minimis* risk. What the court did say was that Congress exhibited no intent to require EPA to prohibit emissions of all nonthreshold pollutants, and citing the Supreme Court decision in *Industrial Union Dept., AFL-CIO v. American Petroleum Institute*, 448 U.S. 607 (1980) stated that "safe does not mean risk free." 824 F.2d at 1153.

The court declined to restrict the Administrator to any particular method of determining what constitutes an acceptable risk, but explained simply that:

the Administrator must determine what inferences should be drawn from available scientific data and decide what risks are acceptable in the world in which we live. 824 F.2d at 1166.

By way of example, the court referred to language in the Supreme Court's *Industrial Union* decision, to the effect that driving a car or breathing city air are risk-laden activities that society does not consider "unsafe." 824 F.2d at 1165. Thus, the determination of what is an "acceptable risk" is discretionary with the Administrator, and involves evaluation of existing scientific data and uncertainties concerning that data.

The EPA disagrees with the commenters' contention that *Public Citizen* demonstrates that "acceptable risk" is limited to *de minimis* risk. *Public Citizen* involved a Food and Drug Administration (FDA) statute prohibiting use of any food coloring additive "found . . . to induce cancer in man or animal." 831 F.2d at 1109. The FDA in that case argued that a *de minimis* exception, allowing use of the challenged additives when the cancer

risks involved are trivial, could properly be interpreted into the statute. The court however, while acknowledging that the cancer risks were indeed trivial, held that the statute imposed an absolute ban once a finding of carcinogenicity had been made, and therefore no *de minimis* exception could be employed.

The situation in *Public Citizen* involving a "no-risk" statute is markedly different from the facts of the *Vinyl Chloride* case. In the *Vinyl Chloride* case the court interpreted that statute as not equating "safe" with "risk free." [citations omitted] 824 F.2d at 1153. Indeed, as explained above, the *Vinyl Chloride* court specifically used examples of activities having acceptable levels of risk "in the world in which we live" [citations omitted] 824 F.2d at 1165, but which exceed the *de minimis* concept described in *Alabama Power*. Thus, unless the *Vinyl Chloride* decision is read to broaden the *de minimis* concept from triviality to a level which is acceptable in the world in which we live, the dicta in *Public Citizen* is an apparent misconstruction of the *en banc Vinyl Chloride* opinion. Furthermore, *Public Citizen* did not deal with a statute requiring a determination of a "safe" level, and therefore cannot reasonably be compared to section 112 of the CAA, and the court's analysis of risk in the *Vinyl Chloride* opinion.

Finally, the *Vinyl Chloride* court's citation of *Alabama Power* does not constitute adoption of the *de minimis* concept. As stated above, the *Vinyl Chloride* decision makes no mention of the *de minimis* concept, and cites *Alabama Power* following a discussion of risks found acceptable by the Supreme Court in *Industrial Union* which clearly exceed *de minimis*. Therefore, at most, *Alabama Power* was apparently cited as an example of a risk level, which would, of course, be considered "acceptable." Obviously, the enumeration of other, higher, risks precludes the interpretation that the court was equating the *de minimis* concept and "safe" or "acceptable risk" in *Vinyl Chloride*. In conclusion, EPA does not believe that the terms *de minimis*, and "acceptable risk" are synonymous. Further, EPA believes that it is not required by *Vinyl Chloride* to reduce risk to a *de minimis* level.

Comment: Several commenters addressed the *Vinyl Chloride* court's finding on acceptable risk versus zero risk. Five commenters felt that "acceptable" risk which the court equated with being "safe" is not zero risk. One commenter stated the court understood that while the scientific

approach can reduce uncertainty, life cannot be risk free.

Another commenter contended that the court erred in the *Vinyl Chloride* case in determining that "safe" does not require the elimination of all risk. He argued that the court's citation of *Industrial Union Dept., AFL-CIO v. American Petroleum Institute*, 448 U.S. 607, 642 (1980), as precedent for this determination was inappropriate.

Response: The D.C. Circuit Court in *Vinyl Chloride* held that the Administrator is required, under section 112, to make an initial determination of what is "safe." 824 F.2d at 1164. The court went on to state specifically that the "Administrator's decision does not require a finding that 'safe' means 'risk free' *Id.*, and further stated that the Administrator must decide "what risks are acceptable in the world in which we live." 824 F.2d at 1165. Thus, the *Vinyl Chloride* court made it clear that "safety" or "acceptable risk" is not to be equated with zero risk.

The *Vinyl Chloride* court cites the Supreme Court decision in *Industrial Union Dept., AFL-CIO v. American Petroleum Institute*, 448 U.S. 607 (1980) as support for the proposition that zero risk is not mandated, stating that *Industrial Union* holds that "something is 'unsafe' only when it threatens humans with a 'significant risk of harm'." 824 F.2d at 1153. *Industrial Union* is clearly an appropriate precedent here.

Regulatory Approaches

Comment: The EPA's proposed approaches were based on a two-step decision process, and some commenters also interpreted the *Vinyl Chloride* decision as requiring a two-step process. Two commenters disagreed, stating that the *Vinyl Chloride* decision does not mandate a two-step procedure for making section 112 decisions, but made clear that an integrated, single-step procedure could be used as long as the decision satisfied both the "acceptable risk" and the "ample margin of safety" criteria. Thus, for example, if existing emissions pose risks that are well below the acceptable risk, the Administrator could determine that both the acceptable risk criterion and the reasonable degree of protection criterion are satisfied in one step.

One commenter believed that as long as protection of public health is given primary consideration and only secondary consideration is given to costs and technological feasibility, a one-step approach agrees with the court's criteria as well as a two-step approach does.

Response: The court in *Vinyl Chloride* specifically addressed the one- or two-step process question, stating as follows:

In response to the facts presented in this case we have analyzed this issue by using a two-step process. We do not mean to indicate that the Administrator is bound to employ this two-step process in setting every emission standard under Section 112. If the Administrator finds that some statistical methodology removes sufficiently the scientific uncertainty present in this case, then the Administrator could conceivably find that a certain statistically determined level of emissions will provide an ample margin of safety. If the Administrator uses this methodology, he cannot consider cost and technological feasibility: these factors are no longer relevant because the Administrator has found another method to provide an "ample margin" of safety. 824 F.2d at 1165 n. 11.

Thus, *Vinyl Chloride* does not mandate a two-step process in all cases. However, if a one-step process were utilized, the Administrator could not consider cost or feasibility.

Comment: One commenter stated that a "decision by the Administrator to force further reductions in risk on the grounds that such reductions are needed to provide an ample margin of safety * * * would be inconsistent with *Vinyl Chloride* if that decision were not based on a reasonable showing of the need to compensate for uncertainty." The commenter urged EPA to conduct, "where information is adequate, a quantitative assessment of the possibility that actual risk exceeds estimated risk, and the extent to which actual risk may be unacceptably high."

Response: This commenter suggested that if there were no possibility of uncertainty, then further reductions to allow for an ample margin of safety would be inconsistent with the *Vinyl Chloride* decision. However, the *Vinyl Chloride* decision, in discussing what is meant by "an ample margin of safety" referred to the Senate's discussion of Section 109. 824 F.2d at 1152. In their report, sponsors of the Senate bill explained that "the purpose of the 'margin of safety' standards is to afford 'a reasonable degree of protection * * * against hazards which research has not yet identified.'" S. Rep. No. 1196, 91st Cong., 2d Sess. 10 (1970), and added that the term is also interpreted to be a "safety factor * * * meant to compensate for uncertainties and variabilities." 824 F.2d at 1152.

The court also recognized that hazardous air pollutants are generally "no threshold" pollutants, meaning that it is a commonly accepted scientific view that there is no threshold below which we are currently able to

determine that a dose of the pollutant carries no risk of adverse health effects. 824 F.2d at 1148. The court added that:

Congress * * * recognized in Section 112 that the determination of what is "safe" will always be marked by scientific uncertainty and thus exhorted the Administrator to set emission standards that will provide an "ample margin" of safety. This language permits the Administrator to take into account scientific uncertainty and to use expert discretion to determine what action should be taken in light of that uncertainty.

While it is hypothetically possible for there to be no uncertainty, the *Vinyl Chloride* court recognized that today, and probably for the foreseeable future, there will be a degree of uncertainty. Thus, EPA is not acting inconsistently with *Vinyl Chloride* in determining that further reductions may be appropriate below the "safe" level (after consideration of the factors relevant to the ample margin decision) in order to account for uncertainty and provide for an "ample margin of safety."

Comment: One commenter wrote that the *Vinyl Chloride* opinion states that "the Administrator 'may, and perhaps must' include additional control measures where technologically feasible, in order to reduce public exposure by a cancer-causing chemical 'to the lowest feasible level'." The commenter therefore believed the correct interpretation of Section 112 of the CAA according to *Vinyl Chloride* is that "EPA must provide such additional protection as is feasible at the second-step 'ample margin of safety' determination."

Response: In the July 28, 1988, notice proposing emission standards for benzene, EPA raised the question of whether "to require all technically feasible controls for which costs are reasonable no matter how small the risk reduction" (53 FR 28541).

The *Vinyl Chloride* case provided that technological feasibility can be considered under section 112, so long as it is not considered in the "acceptable risk" determination, but only in the "ample margin of safety" determination. ("Since we cannot discern clear Congressional intent to preclude consideration of cost and technological feasibility in setting emission standards under section 112, we necessarily find that the Administrator may consider these factors." 824 F.2d at 1163.) The court explained that "it is not the court's intention to bind the Administrator to any specific method of determining what is 'safe' or what constitutes an 'ample margin'." 824 F.2d at 1166. Thus, the court provided that technological feasibility may be considered under

section 112, at the "ample margin of safety" step in the analysis, and that it is within the discretion of the Administrator to determine what weight it is to be given, along with other relevant considerations such as the cost of additional controls. Because the court has specifically sanctioned the consideration of costs as well as feasibility of controls, it is clear that *Vinyl Chloride* does not require imposition of the maximum feasible controls without regard to cost or effectiveness. "Section 112(b)(1)'s command to 'provide an ample margin of safety to protect the public health' is self-contained, and the absence of enumerated criteria may well evince a Congressional intent for the Administrator to supply reasonable ones." 824 F.2d at 1159.

Comment: One commenter stated that the *Vinyl Chloride* court was unequivocal in its conclusion that considerations of cost and feasibility of controls are irrelevant to the question of what level of emission is safe. The commenter stated that *Vinyl Chloride* mandated only a very limited role for consideration of cost and feasibility, and that the acceptable risk decision should not be manipulated to allow consideration of cost and feasibility in the second step.

Another commenter, on the other hand, stated that the court made clear that costs and feasibility are not banished from section 112 decisionmaking. Another commenter argued that given the *Vinyl Chloride* decision reading on the "ample margin of safety" step, EPA can continue to consider technological feasibility, financial factors, and social impacts.

Response: The *Vinyl Chloride* court reviewed the specific language of section 112 with respect to the question of whether cost and technological feasibility may be considered, and found that as they could not discern "clear Congressional intent to preclude consideration of cost and technological feasibility in setting emission standards under section 112, we necessarily find that the Administrator may consider these factors." 824 F.2d at 1163. Thus, the Administrator is not barred from considering these factors at some point in his analyses.

However, the court went on to provide that the Administrator must make an initial determination of what is "safe," and that at this stage "cannot under any circumstances consider cost and technological feasibility." 824 F.2d at 1165. Once a determination has been made to what is "safe," the Administrator is free to consider costs and technological feasibility in setting

standards which provide an "ample margin of safety." Indeed, the *Vinyl Chloride* court suggested that the Administrator is free to consider not only cost and feasibility, but any other reasonable criteria in determining what constitutes an ample margin of safety. 824 F.2d at 1159.

Comment: Several commenters felt that the legislative history of the CAA supports the point that NESHAP should not be based solely on the MIR; instead, the CAA is concerned about impacts on the general population, "not small risks to a few individuals," in order to protect public health.

Other commenters stated that reliance exclusively on the maximum exposed individual to determine acceptable risk is legally unacceptable because it is tantamount to a zero risk, zero emissions policy rejected in *Vinyl Chloride* and in the legislative history of the CAA. Approach D particularly, with its 1×10^{-6} MIR risk criterion, is the practical equivalent of the zero risk philosophy rejected in the *Vinyl Chloride* decision.

Arguing the opposite side, two commenters stated that the CAA requires EPA to base "acceptable risk" decisions exclusively on the cancer risk to the most exposed individuals. The commenters stated that the legislative history of the CAA describes public health as the health of individuals, including particularly susceptible individuals, regardless of where they reside.

Response: The *Vinyl Chloride* decision provides that the Administrator must make a finding of what is "safe," based on available scientific information. What is found to be safe need not be "risk free" but rather must conform to what society finds to be an acceptable level of risk in the world in which we live. 824 F.2d at 1165. Such finding must be based "solely upon the risk to health." 824 F.2d at 1166. The *Vinyl Chloride* case does not specify what particular health risks are relevant, or how they should be measured. Indeed, the court specified that administrative discretion is to be employed and that "it is not the court's intention to bind the Administrator to any specific method of determining what is 'safe.'" 824 F.2d at 1166.

The policy chosen by the Administrator permits consideration of multiple measures of health risk. Not only can the MIR figure be considered, but also incidence, the presence of noncancer health effects, and the uncertainties of the risk estimates. In this way, the effect on the most exposed individuals can be reviewed as well as the impact on the general public. These

factors can then be weighed in each individual case. This approach complies with the *Vinyl Chloride* mandate that the Administrator ascertain an acceptable level of risk to the public by employing his expertise to assess available data. It also complies with the Congressional intent behind the CAA, which did not exclude the use of any particular measure of public health risk from the EPA's consideration with respect to section 112 regulations, and thereby implicitly permits consideration of any and all measures of health risk which the Administrator, in his judgment, believes are appropriate to determining what will "protect the public health."

Policy-Related Comments and Responses

The comments on the four approaches proposed by EPA for making the acceptable risk decision and for providing an ample margin of safety were generally polarized: Approach A was favored largely by industry; Approach D was favored by many private citizens, State regulatory agencies, and public interest groups; Approach B received essentially no support; and, while Approach C was criticized by many industries, private citizens, State regulatory agencies and public interest groups, it received some support from other commenters within these groups. In addition, alternative approaches were suggested by several commenters with some favoring a higher acceptable risk level and others a zero emissions approach.

The EPA considered all of these comments in selecting the final policy for setting standards under section 112. This was done in light of the *Vinyl Chloride* decision; the final policy is described above in this Federal Register notice. The EPA responses to these comments are presented below; they are based on how the comments relate to the final policy and do not address positions and concerns about the four proposed approaches or suggested alternative approaches that are no longer relevant.

In considering the comments on the proposed approaches and alternative suggestions for a policy under section 112, EPA viewed the comments in the context that some positions and concerns expressed by the commenters were diametrically opposed to one another. Thus, EPA realized that no response could completely resolve these positions and concerns. Accordingly, after thoroughly viewing and considering these comments, EPA

selected a final policy for setting standards under section 112.

The following sections are split into discussions by the four alternative approaches presented in the July 1988 Federal Register notice and by ancillary issues that were relevant to selecting the final policy for setting NESHAP. The main positions and concerns presented by commenters are followed by an EPA response to the comments in the context of the final policy.

Approach A Comments: Many commenters favored Approach A on the basis that it would be flexible, it would not be overly simplistic nor based on a single risk measure, it would take into account all relevant health information and uncertainties in risk estimation, and it would be a more balanced and rational approach than the other approaches. One commenter added that only Approach A meets the requirements of the EPA's guidelines for cancer risk assessment and the guidance of the Science Advisory Board for full disclosure of risk uncertainties and quantitative range of risks. Some commenters agreed with the EPA's proposal under Approach A to give less weight to individual risks of 1×10^{-5} or less, saying that risks below 1×10^{-4} are conjectural and the methods used to estimate them are unreliable.

On the other hand, many commenters rejected Approach A because they did not find it stringent enough. One commenter stated that although Approach A has merit in theory because it seems to consider all available health information, the EPA's benzene proposal shows that it would result in pollutant levels far in excess of what should be allowed under section 112. Several commenters found Approach A unacceptable because it does not establish a consistent and equitable policy, thereby allowing different acceptable risk decisions for different pollutants and source categories.

One commenter argued against Approach A, saying that uncertainty information should be considered in the ample margin of safety step, not in the acceptable risk step, because: (1) Considering areas of uncertainty in the acceptable risk step would result in no consistent standards of acceptable risk, since considerations in each case will be different and (2) without a standardized method to allow different non-numerically expressed uncertainties to influence what is acceptable, EPA decisions might appear to be biased or arbitrary.

Response: The EPA agrees with many of these comments. The final policy, like proposed Approach A, is flexible, provides an equitable response to

regulation of air toxics under Section 112, and takes into account all the relevant health information and uncertainty in the risk assessment. The final policy is not overly simplistic (that is, based on a single risk measure) and is clearly consistent with the EPA's guidelines for cancer risk assessment for full disclosure of risk uncertainties and quantitative range of risks. The EPA appreciates the position taken by commenters who supported the EPA's concern that risk estimates less than 1×10^{-5} should be given less weight than risk estimates greater than 1×10^{-4} . The EPA believes, though, that it should reduce risks to less than 1×10^{-6} for as many exposed people as possible. The EPA also agrees with commenters that proposed Approach A may not be stringent enough and, therefore, even though the final policy is similar to proposed Approach A, the application of the final policy results in lower levels of emissions.

The EPA does not agree with commenters who said that several aspects of Approach A (e.g., its flexibility and consideration of uncertainty) would lead to an inconsistent policy allowing different acceptable risk decisions for different pollutants and source categories. The EPA believes that the uncertainties within different risk assessments can appropriately result in different acceptable risk decisions. For example, while EPA strongly believes that emission rates for equipment leaks of benzene are overstated, there is no specific way to account for this belief other than to qualitatively consider it in the acceptable risk decision: EPA sees this as an appropriate use of its expert judgment. In addition, EPA does not agree with commenters who said that the uncertainty of a risk assessment should only be considered in the ample margin of safety decision. Risk assessments are only as good as the weakest information and modeling tools used in the assessments, and the value of the results of these assessments must be considered every time they are used: to ignore the uncertainty of these assessments is scientifically unsound and could result in similarly unsound decisions that may be viewed as inconsistent.

Approach B Comments: No commenters favored Approach B. The commenters who opposed this approach generally fell into two groups: industries, who generally felt that Approach B was too conservative and narrow; and State governments, private citizens, and public interest groups, who felt that Approach B was not stringent enough. Many of the reasons given for

opposition were also stated as applying to other approaches which the commenters rejected for the same reasons.

Many commenters rejected Approach B (also C and D) because it is based on a single measure of acceptable risk (incidence in Approach B) and does not allow EPA to consider the full range of available health information. One commenter said that Approach B is in conflict with the EPA's guidelines for cancer risk assessment because one of the guidelines stated purposes is to "encourage research and analysis that will lead to new risk assessment methods and data." Some commenters opposed Approach B because the incidence is often greatly dependent on the definition of the source category. Most of these commenters felt that Approach B did not consider the maximum exposed individual and did not protect smaller populations from high risk when total incidence is low.

Response: The EPA agrees with most of these comments. The final policy, unlike proposed Approach B, provides an equitable response to regulation of air toxics under section 112 by providing for the consideration of the MIR, yet takes into account all the other relevant health information and uncertainty in the risk assessment, including incidence. The final policy is not overly simplistic (that is, based on a single risk measure) and is clearly consistent with the EPA's guidelines for cancer risk assessment for full disclosure of risk uncertainties and quantitative range of risks. The EPA appreciates the concern of commenters that incidence is often greatly dependent on the definition of the source category.

Approach C Comments: Approach C was supported by several commenters. Two commenters cited a review of 132 Federal regulatory decisions that one of them had published in a journal. The review showed that for large populations, every chemical with an individual lifetime cancer risk above 1×10^{-4} had historically been regulated. In contrast, many commenters rejected Approach C. Some commenters found Approach C too conservative, inflexible, and limiting of the information which could be considered in the acceptable risk decision. Many other commenters rejected Approach C because they did not find it stringent enough. One commenter felt that if Approach C is selected EPA should account for exposures to background concentrations and multiple sources of a pollutant to make sure that no one is at a risk greater than 1×10^{-4} .

Response: The EPA agrees with some of the commenters about Approach C

but disagrees with other commenters. The EPA agrees that in many cases chemicals have been regulated that pose an individual lifetime risk of greater than 1×10^{-4} and, therefore, disagrees with commenters who viewed Approach C as too conservative and also with commenters who found this approach not stringent enough. At the same time, EPA agrees with commenters that Approach C was inflexible and did not consider all the relevant health information and uncertainty in the risk assessment. Accordingly, as indicated in the discussion of the final policy, EPA believes that MIR levels greater than approximately 1×10^{-4} are presumptively unacceptable but that the risk estimates must be considered in light of all the relevant health information and the uncertainty in the risk assessment. As part of this perspective, EPA agrees that exposures to background concentrations and multiple sources of a pollutant may be considered to the extent that it is practical and reasonable to do so.

Approach D Comments: A large group of State agencies, public interest groups, and private citizens supported this approach. Their primary reason for support was because this was the most stringent approach, but other reasons included consistency with existing State air toxics programs and Federal regulations and accounting for underestimation of risk. A few commenters favored Approach D in order to protect public health in a multiple carcinogen environment. One commenter favored an approach more conservative than Approach C because the public views ambient exposures to air pollutants as more frightening and less acceptable than other risks encountered in daily life. Some commenters supported Approach D because it was consistent with State and other Federal regulations (e.g., FDA regulations).

The commenters who rejected Approach D did so for a variety of reasons. Some found Approach D too conservative, inflexible, and limiting in the information which could be considered in the acceptable risk decision. One commenter rejected Approach D because the 1×10^{-6} MIR level is below that which could be determined in the population; thus, violations could never be proven. Several commenters disagreed with those who argue that a 1×10^{-6} acceptable risk level is justified due to concern about exposure to multiple chemicals; these commenters said that section 112 regulatory decisions should not be based on concerns about

chemical exposures that have little relevance to the pollutant and source category being regulated. One commenter rebutted commenters who stated that Approach D is consistent with the FDA's use of a 1×10^{-6} benchmark under the Delaney clause when "fairly uniform and consistent exposures (food) in large groups of the population" are being regulated. The FDA uses different risk measures than MIR, and develops average risks based on consumption patterns and average (not worst-case) concentrations in food. One commenter disagreed with comments submitted by several State agencies indicating a preference for the use of an MIR of 1×10^{-6} in setting NESHAP. Although these commenters felt this level would be consistent with their State air toxics programs, this commenter stated that the use of the 1×10^{-6} level in these programs differs from that in NESHAP regulations because the State programs are currently implemented as policies or guidelines and allow waivers or flexibility if technology cannot reduce risks to below 1×10^{-6} . One commenter disagreed that there is a public consensus that only 1×10^{-6} MIR is acceptable, because many citizens do not understand the assumptions and meaning of MIR.

Many commenters felt either that even the risk level of 1×10^{-6} given in Approach D was unacceptable or not protective enough of public health, or that "acceptable" risk is zero risk.

Response: The EPA agrees with commenters that felt that Approach D was too conservative, inflexible, and limiting of the information which could be considered in the acceptable risk decision. The EPA also agrees with commenters who stated that consistency with State and Federal regulations must be viewed in light of the purpose and actual implementation of those regulations and, specifically, agrees that comparing NESHAP requirements with State programs (many of which are guidelines and contain waivers or flexibility if technology cannot achieve the programs' stated goals) is inappropriate. Also, EPA finds the comment that there is a public consensus that only an MIR of 1×10^{-6} or less is acceptable to be difficult to support given the wide range of positions expressed in this rulemaking. However, one of the goals of the policy for standards-setting under *Vinyl Chloride* is to protect a large majority of the exposed population to risks no higher than about 1×10^{-6} .

While EPA agrees that multiple exposures to chemicals are important to

understand and consider in the EPA's overall implementation of its public health mandates, EPA disagrees that these exposures should be routinely evaluated and considered in selecting standards under section 112. In taking this position, EPA is agreeing with commenters who said using these exposures explicitly in selecting standards would be very difficult and possibly impractical. The EPA also disagrees with commenters who said that even the risk level of 1×10^{-6} given in Approach D was unacceptable or not protective enough of public health, or that "acceptable" risk is zero risk.

Alternative Acceptable Risk Approaches: Several commenters proposed variations on, or alternatives to, the EPA's four proposed approaches for determining acceptable risk. Several of these were modifications to the case-by-case approach (A). Another group argued for more stringent criteria than Approach D, with an ultimate goal of zero risk. A third group provided various other alternative acceptable risk levels.

Comment: As a modification, one commenter developed a variety of risk estimates for benzene ranging from "most plausible" to "plausible upperbound" and "plausible lowerbound" estimates for annual incidence and MIR, and attached probabilities that each estimate represents the true risk. A modified version of Approach A would make use of this range of risk estimates. Several commenters supported a suggested modified version of Approach A, which used a three-step process for arriving at decisions with the first step using a "most plausible" MIR. One commenter proposed a modified Approach A that established a preferred annual incidence rather than a preferred MIR as a guideline for acceptable risk. One commenter supported a modified Approach D (acceptable risk defined as MIR of 1×10^{-9}) that would also require the application of maximum available control technology to all sources regardless of their MIR. Some commenters stated that only zero risk is acceptable, while others suggested progressive risk reduction to achieve an ultimate goal of zero risk. A phased risk-reduction approach with a goal of zero emissions was proposed by one commenter and several other commenters including other environmental groups and private citizens.

Response: The EPA has not chosen to use a variety of risk estimates for benzene ranging from "most plausible" to "plausible upperbound" and "plausible lowerbound" estimates for

annual incidence and MIR with their associated probabilities for each estimate to represent the "true" risks to consider in making the acceptable risk decision. First, EPA considers its MIR estimates as "plausible, yet conservative" and therefore does not agree that an estimate based on the perspectives of these commenters is appropriate. If EPA were to accept the commenters' suggestions, the EPA's MIR estimate would no longer represent the maximum potential risk posed to individuals located adjacent to sources of benzene. Second, even though EPA agrees that considering the uncertainty of its risk assessments is appropriate, EPA does not agree that developing explicit probabilities for risk estimates is a practical technique to use in making acceptable risk decisions, especially considering the data inadequacies associated with many risk assessments. Third, the aggregate population risk or incidence estimates calculated by EPA for benzene are "plausible" estimates given the EPA's estimating techniques. Accordingly, as discussed in more detail in the "Risk Assessment Comments and Responses" section of this preamble, EPA has not changed the basic estimating techniques used in its risk assessments even after considering these comments.

The EPA also disagrees that Approach A should be modified with a preferred incidence level in place of the preferred MIR. The MIR estimate is used to ensure appropriate protection to all individuals. A preferred incidence level would not provide this protection. Incidence estimates are aggregated population risks and would result in protecting the total population from hazardous air pollutants but would not ensure any particular level of protection for individuals. While EPA agrees that incidence should play a part in the acceptable risk decision, EPA does not believe that incidence estimates should be the principal factor considered.

The EPA does not agree with the commenters that combine technological feasibility or phased technology approaches in the acceptable risk decision. This decision is to be based on health consideration only and, therefore, the approaches suggested by these commenters are not appropriate.

Comment: Four commenters advocated higher levels of acceptable risk than those proposed in any of the EPA's approaches. These commenters suggested: (1) An acceptable risk level of an MIR of 1×10^{-3} ; (2) a level no lower than other unavoidable risks such as the risk imposed by natural background radiation (3×10^{-3}); (3) a level associated

with activities already accepted by society, which the commenters claimed would be higher than any of the four proposed approaches; and (4) a risk level reflective of the use of private automobile transportation (lifetime risk approaching 1×10^{-2}) referred to in the *Vinyl Chloride* decision and also by the Supreme Court as an acceptable risk "in the world in which we live."

Response: The EPA does not agree with the commenters who advocated higher levels of risks than any considered in the July 1988 **Federal Register** notice. While some commenters interpreted the *Vinyl Chloride* decision to mandate these high risk levels, EPA believes that the *Vinyl Chloride* decision requires EPA to consider societal risks and make an expert judgment. The EPA completed such considerations, made an expert judgment and, consequently, selected a presumptive MIR level of approximately 1×10^{-4} . For the sources considered in this notice, EPA believes that associated risks in the range of 1×10^{-2} and 1×10^{-3} are too high, and unacceptable.

Comment: One State agency supported the establishment of an acceptable MIR range and suggested 1×10^{-7} to 1×10^{-4} . If risks are below the low end of the range, no action to even examine controls would be necessary. The high end of the range would be a ceiling that could not be exceeded regardless of circumstances. (The commenter specifically said that risks on the order of 1×10^{-2} MIR should never be considered acceptable.) The commenter stated that within the 1×10^{-7} to 1×10^{-4} range, other factors such as uncertainties, incidence, and feasibility and affordability of emission reduction strategies should then be considered to determine whether a lower risk within the defined range is appropriate.

Response: This comment is similar to the final policy for determining the acceptability of the risks associated with hazardous air pollutants and then selecting an ample margin of safety. The EPA believes its approach is generally consistent with this comment although EPA would like to add that it is important to consider the uncertainty and other factors in making the acceptable risk decision. In addition, in some cases, risk estimates higher than approximately 1×10^{-4} can also be acceptable after the relevant factors have been considered.

Risk Comparisons in the Acceptable Risk Decision: Several commenters expressed positions on whether comparison of hazardous air pollutant risks with other risks encountered by

society should be considered in making the acceptable risk decision. Some commenters thought comparisons were appropriate while others did not.

Comment: Several commenters thought that as part of the acceptable risk decision, EPA should compare benzene risks with other risks that are encountered in ordinary life and accepted by society. They generally used comparative risks as an argument in favor of Approach A and as evidence that risks of 1×10^{-4} , or even higher, could be considered acceptable. The commenters said such comparisons are consistent with the *Vinyl Chloride* decision's reference to consider the acceptability of risk in "the world in which we live." Many commenters listed several activities encountered in daily life which entail lifetime risks in the 1×10^{-3} to 1×10^{-4} range as evidence that this level of risk could be considered acceptable.

Other commenters said comparison of hazardous air pollutant risks with other common risks is not an appropriate factor to consider in the acceptable risk decision. Three of these commenters said that the comparison is inappropriate because benzene and other toxic air pollutants are man-made and benzene emissions and risks are controllable, whereas many other risks encountered in everyday life are uncontrollable or accidental. Others said the comparison is not valid because risks such as driving a car are voluntary, whereas pollutant exposures are involuntary. One commenter also said comparisons are not accurate because benzene risks do not consider all health impacts, and are more uncertain than other societal risks that can be accurately measured. Similarly, another commenter stated that people are willing to accept higher levels of risk when actual risk can be calculated with certainty. When risks are uncertain, such as with benzene and other environmental hazards, only a low level of risk is tolerated because actual risks may be higher than estimated risks.

Response: The *Vinyl Chloride* decision provides for such comparisons and for EPA to make an expert judgment on the acceptability of the risks for sources of hazardous air pollutants. However, EPA believes that it is prudent to view such comparisons cautiously and to reflect the uncertainty in such comparisons in the EPA's decisions on the acceptability of the risks for sources of hazardous air pollutants. Factors, such as whether the risks are voluntary, controllable, manmade, and uncertain, lead EPA to be cautious in making such comparisons. After considering these

risks, EPA has determined that MIR's greater than approximately 1×10^{-4} are presumptively unacceptable and can only be rebutted by careful examination of the other relevant factors, including uncertainty.

However, in this regard, it is important to point out that MIR estimates are based on a different and, more conservative, concept than average risk expressions such as the risks associated with motor vehicles, or the risk of being killed by lightning. Average risks generally apply to the total population and do not reflect the distribution of risks across the population. For example, the average lifetime risk of death due to motor vehicle accidents is about 5×10^{-3} . A city with a population of 2 million might, therefore, expect about 150 traffic-related deaths every year even though some members of this population are at greater risk. On average, this 150 deaths every year does not express the incidence rate for those members of the population. In contrast, if the MIR at a typical industrial facility located in a city of 2 million population is 5×10^{-3} , the annual estimated incidence would only be about 1 death in 20 years (0.005 case/year). Thus, while EPA believes that MIR risks greater than approximately 1×10^{-4} are presumptively not acceptable, EPA maintains that commenters who apply the MIR to entire populations are improperly characterizing population risks as well as the MIR.

Comment: Three commenters said that if levels of exposure are within the bounds of variation in ambient background levels, the activity should not be regulated. Another commenter cautioned that background concentrations considered for comparison of acceptable risk should be natural benzene levels in clean air, not levels in already polluted urban air. One commenter stated that EPA must consider other sources of risk from benzene exposure and determine whether the acceptable risk level is to represent total risks from all exposures to a substance or just incremental risks to ambient risks.

Response: The EPA believes that comparison of estimated MIR levels to natural background risk levels is appropriate to help characterize the overall magnitude of the risk that remains after making the acceptable risk decision. However, EPA also agrees that comparison of acceptable risk should not be associated with levels in polluted urban air. With respect to considering other sources of risk from benzene exposure and determining the

acceptable risk level for all exposures to benzene, EPA considers this inappropriate because only the risks associated with the emissions under consideration are relevant to the regulation being established and, consequently, the decision being made.

Ample Margin of Safety Decision: Several commenters expressed opinions on what factors should be considered in the decision on what level of regulation provides an "ample margin of safety" as required by Section 112 of the CAA and the *Vinyl Chloride* decision. Some commenters argued for strong consideration of health effects and uncertainties, while others emphasized consideration of economic impacts or a balancing of multiple factors. Requiring "best" control technologies as part of the ample margin of safety step was also recommended by some.

Comment: Four commenters suggested that in the ample margin of safety decision, EPA should give greater consideration to health effects, noncancer effects, alternate exposure pathways, co-emitted pollutant risks, nonquantified health effects, interactions among pollutants, and uncertainties not taken into account in the EPA's risk estimates. One commenter, supported by several others, said that an ample margin of safety means no less than elimination of all avoidable risks.

Some commenters identified additional economic factors that they thought should be considered and that would lead to more stringent regulatory decisions. One commenter asked that EPA consider the economic impact on the families of cancer victims. Another commenter stressed the high cost of emotional suffering, not only for leukemia victims, but also for their family and friends. In a similar vein, two commenters pointed out that there are many costs to society associated with the deaths and illnesses associated with pollution, such as emotional costs to families, medical costs of treatment and institutionalization, and weakening of the gene pool.

Several commenters suggested that the following factors be considered in the ample margin of safety decision: (1) The scientific and statistical uncertainties in the risk estimates including the likely impact of uncertainties on the estimate of most plausible risk, (2) the availability of technologically feasible controls, (3) the likelihood of plant closures and consequential effects of unemployment, (4) the cost effectiveness of additional controls, and (5) the likelihood that

emissions will increase or decrease in the future.

Two commenters suggested that, as a means of weighing the various factors in determining an ample margin of safety, EPA should establish a value for cost per life saved. They claimed this approach would allow consistent decisionmaking, fairness, and wise use of resources. One commenter stated that existing sources and new sources could be treated differently in the ample margin of safety step, allowing a higher risk level for old plants that will close soon.

Response: The EPA agrees with many of these comments in principle. However, EPA believes the relative weight of the many factors that can be considered in selecting an ample margin of safety can only be determined for each specific source category. This occurs mainly because technological and economic factors (along with the health-related factors) vary from source category to source category. The EPA agrees, in principle, with the commenter that stated that existing sources and new sources could be treated differently in the ample margin of safety step to allow a higher risk level for old plants that will close soon. However, while EPA will endeavor to fully consider all the relevant factors in the selection of final standards under Section 112, it is not possible to cite a specific decision process upon which such selections will be made.

In summary, it is important to note the overall impacts of the final standards which were selected to provide an ample margin of safety for the source categories under consideration in this rulemaking. The EPA believes the benzene emissions from these source categories do not exceed the acceptable risk benchmark of approximately 1×10^{-4} after weighing all the appropriate health-related factors for and against this presumptive benchmark. In addition, these standards reduce the total national cancer incidence due to the sources considered in this notice to 1 case every 3 years (0.3 case/year); the vast majority of this incidence is associated with the population exposed to risks less than 1×10^{-6} . To achieve this ample margin of safety, owners or operators of the sources affected by the standards promulgated today will spend, nationwide, about \$16 million/yr (1984 dollars).

Comment: Several commenters responded to the EPA's question of whether maximum feasible control should always be required. Several commenters advocated technology-

based approaches to setting NESHP or ensuring an "ample margin of safety," while others said cost/benefit analyses should be used to determine whether control technologies should be applied. Several commenters suggested requirements for application of all feasible control technologies, although their definitions of feasibility differed. In contrast, several other commenters said it is not appropriate to require maximum controls in all cases, and suggested cost/benefit analyses to determine when additional control should be required to provide an ample margin of safety. The commenters stated that the "ample margin of safety" step does not require imposition of all technologically feasible controls short of plant closure, and suggested that an analysis of incremental risk reduction benefits versus incremental costs of additional controls be performed to determine if additional control is warranted.

Response: After considering these comments, EPA concluded that all the relevant health, technological and economic information should be considered in making the ample margin of safety decision. Accordingly, EPA rejects the position that the maximum feasible control technologies should be applied in all cases and accepts the position that an analysis of incremental risk reduction benefits versus incremental costs of additional controls be performed to help determine if additional control is warranted. However, EPA would like to clarify this conclusion by noting that it does not intend to use "bright-line" cost-effectiveness ratios to make the ample margin of safety decision but rather will consider such information with all the other relevant information available for this decision.

Treatment of Uncertainty: The response to the EPA's solicitation of comment regarding the treatment of uncertainty varied from approval of the EPA's position to suggestions that uncertainty should force stricter standards, or conversely, prohibit restrictive standards. One group of commenters stated that EPA had shown a good appreciation of the uncertainty associated with the scientific evaluation of health data and the exposure data used in estimating risk. Commenters also provided recommendations on which step of the decision process was the appropriate place for the consideration of uncertainty.

Comment: Some commenters favored consideration of uncertainties in the acceptable risk step of the decision process, while others felt it is more appropriate to consider uncertainties in

the ample margin of safety step. One commenter, supported by several others, stated that it would not be appropriate to evaluate the "safe" level and the "margin of safety" without taking the uncertainties into account. Another commenter said it would make no sense to determine what is a "safe" level without considering the strengths or weaknesses of the evidence implicating the pollutant in question. Others stated that questions of uncertainty and conservatism cannot be separated or deferred from the determination of acceptable risk. Other commenters felt consideration of uncertainty should be deferred until the ample margin of safety step. Most of these commenters believed that the MIR should be the sole criterion for making the acceptable risk decision, and that uncertainties and other factors are best considered in the ample margin of safety step. Another commenter agreed that uncertainties should be accounted for in the ample margin of safety step and added that these uncertainties should not be addressed by incorporating unscientific, over-conservative assumptions into the risk assessments.

Response: The EPA believes that it is essential to consider the quality of the information it uses to make decisions when the decisions are being made. Thus, EPA agrees with commenters that stated that it would be inappropriate to evaluate the "safe" level and the "margin of safety" without taking the uncertainties (both scientific and technological) into account. Because EPA has concluded that many factors should be considered in making the acceptable risk decision, EPA disagrees with commenters who believed that, because the MIR should be the sole criterion for making the acceptable risk decision, uncertainties and other factors are best considered in the ample margin of safety step.

Comment: Several commenters proposed that uncertainty should be quantified to the extent possible to aid NESHP decisionmaking. Another commenter recommended the use of sensitivity analyses to illustrate the effect of the assumptions used on the resultant magnitude of the risk estimate. Some commenters recommended a conservative risk estimation approach to protect against uncertainties. Some also stated that when there are uncertainties, the EPA should act with extraordinary prudence and caution, and that uncertain health effects not considered in the risk assessment should be viewed as serious and unacceptable consequences of exposure to a pollutant.

Response: As discussed in the EPA's responses to comments on its risk assessment for benzene source categories, EPA cannot reliably quantify the uncertainty of its risk assessments to the degree envisioned by some commenters. The EPA is not convinced that data are available to enable rigorous statistical analyses designed to quantify accurately the uncertainty of the estimates associated with its risk assessments. In addition, EPA did not find that these commenters made a convincing case for how such analyses would help in making decisions. However, as a matter of policy, EPA considers it important to understand the uncertainty of its risk assessments and attempts to quantify this uncertainty in a reasonably practical manner. In many cases, the uncertainty of particular risk assessments will be characterized qualitatively but may be characterized quantitatively if it is practical and appropriate to do so.

Risk Assessment Comments and Responses

Introduction: The EPA received many comments that were concerned with the characterization of the potential adverse health effects associated with human exposure to benzene. Most of these comments addressed the numerous assumptions and uncertainties associated with the benzene risk assessment. The EPA recognizes that there is a wide range of views on the risk assessment methodologies and assumptions that were used in this analysis. For this reason, EPA was particularly interested in receiving public comments on the benzene risk assessment. Considerable effort was made in reviewing and responding to each comment that was submitted.

The EPA believes that the estimates of risk for the benzene source categories are based on the most current scientific knowledge and on sound scientific judgment. In some instances, inferences were required due to uncertainties in areas where there is no scientific consensus. The EPA incorporated these judgmental positions (science policies) into the benzene risk assessment based on an evaluation of the currently available information and on the regulatory mission of EPA to protect public health. The risk assessment conducted by EPA is consistent with the principles and procedures described in the 1986 Guidelines for Carcinogen Risk Assessment (51 FR 33992) and Guidelines for Exposure Assessment (51 FR 34042). These guidelines were developed by scientists in EPA, and were extensively reviewed by the public

and by expert scientists in industry, academia, environmental groups, and other governmental agencies.

Each of the four parts of the risk assessment for benzene, including hazard identification, dose/response assessment, exposure assessment, and risk characterization, are described in detail in the July 28, 1988, **Federal Register** notice (53 FR 28496) announcing the proposed rule for benzene sources. To put the comments and responses into their proper context, a brief review of the components of the benzene risk assessment is provided below.

Benzene was broadly recognized as a potential human carcinogen in the early 1970's with the publication of several epidemiological studies of benzene-exposed workers (Docket No. OAQPS 79-3, Part 1, Item X-2). Although health effects other than leukemia (such as aplastic anemia and multiple myeloma) have been attributed to benzene, the serious nature of this disease and the uncertainties regarding the existence of any risk-free levels of exposure combined to make it of central importance in the hazard assessment.

Since risks associated with low ambient exposure levels cannot be measured directly either by animal experiments or epidemiological studies, EPA relies upon mathematical modeling techniques to extrapolate from high to low dose. For benzene, this estimate is derived from the dose/response relationship observed in the occupational studies and represents the estimated upperbound on the increased risk of contracting leukemia for an individual exposed for a lifetime (70 years) to a specific concentration of benzene (e.g., 1 part per million [ppm]) in the air. The EPA has elected to use the linear nonthreshold assumption for the benzene dose/response assessment, which results in a plausible estimate of the leukemia unit risk to the exposed population. If the true dose/response relationship at low doses is sublinear (i.e., is such that the response at low doses is less than predicted by the linear model), then the unit risk estimate (URE) would err on the high end and in favor of the protection of public health. The limited data from which the extrapolation is made are consistent with the use of the linear model.

In the absence of adequate monitored ambient air levels of pollutants near industrial sources, EPA uses mathematical models to predict the dispersion of emissions and subsequent potential for human exposure. Estimates of the concentrations of benzene to which the population may be exposed and the magnitude of public exposure were developed using the EPA's Human

Exposure Model (HEM). The HEM accepts as inputs the locations and emission characteristics of the subject source categories of benzene. This information is combined with census and meteorological data contained in the model to estimate the magnitude and distribution of population exposure.

There are uncertainties inherent in the derivation of the cancer URE for benzene and in the estimation of exposure by the HEM. These uncertainties may lead to either an overestimation or underestimation of the potential leukemia risk to the exposed population. Although there are uncertainties associated with the methods and assumptions used in the benzene risk assessment, EPA considers the analysis to represent a reasonable and appropriate approach to the estimation of potential health risks. A complete description of these uncertainties is found in the July 28, 1988, **Federal Register** notice (53 FR 28496) and in the response to comments found below.

The exposure estimates obtained from the HEM are combined with the estimate of carcinogenic potency for benzene (i.e., URE) to calculate the probability of the increased risk of cancer in the exposed population. Two measures of excess leukemia risks are calculated: the aggregate population risk, and the maximum individual lifetime risk (MIR). Because of the assumptions and uncertainties in the dose/response assessment and exposure assessment, these risks cannot be construed as absolute measures of the true risk burden to the benzene-exposed population. The quantitative risk assessment is best viewed as a relative estimate of the likelihood of cancer associated with benzene emissions from an industrial source category, for comparison with estimates from alternative emission scenarios or other benzene source categories. The estimated annual cancer incidence and MIR resulting from ambient exposure to predicted ambient concentrations of benzene emitted from the industrial source categories are summarized in section III of this **Federal Register** notice.

The EPA received comments in three broad areas of the risk assessment for benzene source categories: (1) Qualitative and quantitative aspects of the benzene health assessment; (2) the exposure analysis used to estimate the MIR, risk distributions, and cancer incidences associated with exposure to benzene; and (3) uncertainties in the risk assessment. A general review of these comments and the EPA's responses is found in the following three sections. A

more detailed discussion of specific comments and responses can be found in the BID.

Benzene Health Assessment Comments: Comments on the EPA's health risk assessment for benzene can be grouped into three main areas: (a) health effects endpoints considered in the risk assessment, (b) the selection of epidemiological studies, and (c) the mathematical dose/response models used to derive the cancer URE. Each of these comment areas is briefly described and addressed below.

Comment: Several commenters discussed which health effects endpoints should be included in the risk analysis. Some of these commenters felt that only risks from acute myeloid leukemia (AML) should be considered, since in their view a clear association between exposure to benzene and other cancer types has not been established. In contrast, one commenter pointed out that there is substantial evidence from case reports and epidemiologic studies that benzene causes all major cell types of leukemia as well as lymphomas and other diseases.

Response: The EPA believes that there is insufficient evidence to discount the association of benzene with leukemia types other than AML. In addition to leukemia, several studies (described in 53 FR 28496) have noted increases in other cancers, most notably lymphosarcoma and multiple myeloma. There is substantial evidence from case reports and epidemiological studies that benzene causes all major cell types of leukemia as well as lymphomas and other diseases. This is consistent with the observation that other leukemogens (e.g., radiation, oncogenic viruses, alkylating agents, and anti-neoplastic drugs) cause cancers in different cell types. The EPA therefore does not agree with the commenters who argued that AML is the only type of leukemia caused by benzene.

Comment: Other commenters felt that the risks to human health are understated because cancers other than leukemia, as well as noncancer health effects such as immunotoxicity, are not explicitly considered in the EPA's risk assessment.

Response: Although human exposure to benzene in the workplace has been associated with leukemia, aplastic anemia, multiple myeloma, lymphomas, pancytopenia, chromosomal breakages and depression of bone marrow, EPA believes that the leukemia incidence in epidemiology studies provides the most comprehensive and up-to-date basis for dose/response estimation purposes. In benzene-exposed animals, toxic effects

such as histopathological changes in the testes and bone marrow have been observed. Toxicity of the hematopoietic system as well as cytogenetic effects in humans have been causally related to benzene exposure; however, the magnitude and duration of exposure required to elicit these effects are not developed at this time.

The estimated ambient levels of benzene associated with emissions from stationary industrial sources after controls are applied (in the low parts per billion range) are generally at least three orders of magnitude lower than levels associated with noncancer health effects in animals (in the ppm range). The carcinogenic effect, however, unlike noncancer health endpoints, is presumed to be nonthreshold in nature. Consequently, in the interest of protecting public health, EPA has identified carcinogenicity, specifically leukemia, as the health endpoint of greatest concern in this risk assessment.

Comment: Several commenters criticized the data sets used by EPA to derive the URE. One commenter argued that the quantitative risk assessment on the benzene-induced risk of leukemia should be based solely on the occupational cohort studied by Rinsky (1987) since it is the best among all available epidemiologic studies.

Response: The EPA maintains that data from studies other than the Rinsky study should also be used for the purpose of risk calculation, since no single study is necessarily better than any other. Although the Rinsky study possesses many of the attributes of a good epidemiologic study, it still suffers from a lack of definitive information concerning the levels of benzene exposure to which the rubber hydrochloride (pliofilm) workers were subjected in the 1940's. Furthermore, in response to a petition on October 17, 1984, from the NRDC, EPA evaluated the most current scientific literature on benzene carcinogenicity and revised the URE accordingly. A discussion of this reassessment can be found in the July 28, 1988, *Federal Register* (53 FR 28496) announcing the EPA's proposed rule for benzene sources.

Comment: One commenter stated that the Crump and Allen exposure estimates of 1984 are more representative of the benzene levels to which workers in the Rinsky cohort were exposed prior to 1946. The commenter argued that these estimates should be used by EPA, rather than using the estimates in both this study and the study by Rinsky.

Response: The EPA believes the use of only the Crump and Allen exposure estimates does not reduce the uncertainty associated with the

assumed benzene exposure levels prior to 1946, which was a period for which no industrial hygiene data were available. The argument that the Crump and Allen exposure estimates are superior to the Rinsky estimates is based on an observation that the Crump and Allen exposure estimates have a high correlation with rising peripheral blood counts (higher blood counts are associated with lower exposure levels), while no correlation is found for the Rinsky estimates. The EPA believes that this finding of a high correlation is "artifactual." Blood counts rose in both exposed and unexposed employees over time, which may have been due to changes in diagnostic methods, techniques, or interpretations. Given the uncertainty associated with the Crump and Allen exposure estimates, EPA feels that both the Rinsky and the Crump and Allen exposure estimates should be considered in the risk assessment.

Comment: Several commenters had suggestions for improvement of the dose/response assessment portion of the risk analysis. Some commenters criticized the linearized extrapolation model used by EPA for carcinogen risk assessment, and asserted that the existing data suggest a nonlinear and threshold dose/response relationship. These commenters urged EPA to update its dose/response model by using new scientific advances in toxicology, pharmacokinetics, and biologically-based dose/response models. Other commenters supported the use of the linear, nonthreshold model.

Response: The EPA does not agree with the comment that the demonstration of a nonlinear dose/response relationship in the observed data is a sufficient basis to argue that the shape of the dose/response curve is nonlinear at untested low dose levels. The EPA's view is that linear low dose extrapolation is preferred, unless low dose data and/or mechanism of action or metabolism data show otherwise. The EPA also believes that it is premature to assume a threshold effect for benzene due to the lack of understanding about the mechanism of carcinogenic action. The EPA has elected to use the low dose linear nonthreshold assumption for the benzene dose/response assessment because as a matter of science policy, EPA prefers to use assumptions which will provide risk estimates which are not likely to be exceeded given the lack of understanding about the mechanism of carcinogenic action. This choice of models results in an upperbound (because of the linear assumption) estimate of leukemia risk to the exposed population.

Comment: A new risk extrapolation model was offered by one commenter, who described the model as a significant improvement over the existing EPA risk assessment because more biological information (e.g., the use of latency period actually estimated from the data) is incorporated and a better exposure estimation procedure (i.e., the use of individual exposure information rather than categorical data) is used.

Response: The EPA does not agree that this new assessment procedure is, *a priori*, an improvement over the EPA procedure because EPA believes the way that cellular dynamics and latency are incorporated in the new model is both mathematically and biologically inappropriate. While EPA believes that the linear nonthreshold dose/response assessment for benzene is the most appropriate approach at this time, EPA encourages the development of new approaches that involve the incorporation of biological information, as appropriate, into the risk assessment procedure.

Exposure Assessment Comments: Comments on the EPA's assessment of human exposure to benzene emissions address three principal areas: (a) The analytical assumptions underlying the assessment, (b) the choice of atmospheric dispersion models, and (c) the matching of predicted concentrations with exposed populations.

Comment: A number of commenters took issue with the EPA's assumption that people living in the vicinity of benzene sources were exposed continuously, for a 70-year lifetime, to predicted long-term ambient benzene levels. Commenters maintained that the average lifetime of an industrial facility is considerably less than 70 years, that few individuals would be expected to live in the same location for their entire lives, and that the EPA's assumption did not provide for the fact that people spend a much greater proportion of their time indoors rather than outdoors. Commenters suggested alternative assumptions ranging from 15 to 35 years based on plant life and duration of residency estimates, and 4 to 22 hours of exposure per day based on the time individuals spend outdoors.

Response: The EPA recognizes that the assumption of 70 years of continuous exposure constitutes a simplification of actual conditions and represents, in part, a policy judgment by EPA, but feels that this assumption is preferable to the alternatives suggested. Although emissions of benzene from industrial sources would reasonably be expected

to change over time, such changes cannot be predicted with any certainty. In lieu of closing, plants may elect to replace or even expand their operations and subsequently increase their emissions. The 70-year exposure duration represents a steady-state emissions assumption that is consistent with the way in which the measure of carcinogenic strength (i.e., URE) is expressed (i.e., as the probability of contracting cancer based upon a lifetime [70 year] exposure to a unit concentration). Constraining the analysis to an "average" plant lifetime carries the implication that no one could be exposed for a period longer than the average. Since, by definition, some plants would be expected to emit longer than the average, this assumption would tend to underestimate the possible MIR.

The EPA agrees that the U.S. population is highly mobile and spends a proportionally greater amount of time indoors than outdoors. However, adjusting the exposure assumptions to constrain the possibility of exposure to benzene emissions implies that exposure during the periods inside or away from the residence are zero. In addition, a less-than-lifetime assumption would also have a proportional impact on the estimated MIR, suggesting that no individual could be exposed for 70 years. On balance, EPA believes that the present assumption of continuous exposure is consistent with the steady-state nature of the analysis and with the stated purpose of making plausible, if conservative, estimates the potential health risks. It is the EPA's opinion that this assumption, while representing in part a policy judgment by EPA, continues to be preferable to the alternatives suggested, both in view of the shortcomings of such alternatives and in the absence of compelling evidence to the contrary.

Comment: Commenters also challenged the EPA's failure to quantitatively consider the additivity of exposure to multiple benzene sources and the potential for indirect (nonair) exposure from the deposition or bioaccumulation of historical emissions.

Response: The EPA agrees that individuals residing in the vicinity of multiple benzene sources would be exposed to higher levels of benzene than is represented by the individual point source modeling approach used. The increase, however, would be expected to be very small and would not affect the estimate of population risk since each source would be modeled individually and the population risks aggregated across the category. The EPA has concluded from sensitivity analyses that

the impact on the MIR estimates would be very small, since concentration falls off quickly with distance from the source, and would, in most cases, fall within the rounding error of the estimates.

Although the purpose of section 112 is the regulation of air emissions of hazardous pollutants, EPA is aware of the potential for some substances to accumulate in other media or the food chain and result in indirect exposure. Available data, however, do not indicate that air emissions of benzene are accumulated by plants, animals, or soil or that significant indirect exposure is occurring. The EPA recognizes that concurrent exposure to other pollutants could adversely impact public health; however, no data are available concerning possible synergistic or antagonistic interactions with benzene.

Comment: Some commenters maintained that the EPA's choice of dispersion models and selection of modeling parameters and input data caused the benzene risks to be overestimated. Specifically, commenters recommended the use of an area source model such as the Industrial Source Complex Long-Term (ISC-LT) over the HEM for estimating MIR from benzene fugitive emission sources. Other suggestions included consideration of benzene's atmospheric instability and the use of site-specific meteorological data and more years of data (70) as compared to the averages of 1 to 5 years of data from the nearest Stability Array (STAR) station.

Other commenters criticized the assumption of flat terrain characteristic of the HEM model and maintained that this would result in underestimation of the health risks.

Response: The EPA agrees that the use of more sophisticated dispersion models, where justified, would result in more accurate concentration estimates. The EPA does not agree, however, that the substitution of a model such as the ISC-LT would result in substantial changes in the estimated risks or that the changes would be only in a downward direction. In addition, as the commenters noted, the use of more sophisticated predictive models is often precluded by the input data requirements, particularly where a large number of emitting sources, or emission points within the sources, are being assessed. The EPA does not generally utilize more sophisticated dispersion models unless the input data are of sufficient quality to ensure that the models' outputs are of better quality than those available from the screening model in the HEM. For the benzene

sources addressed in this notice, EPA believes that the use of the HEM screening model was an appropriate choice.

The EPA agrees that the use of site-specific meteorology, where available in the appropriate amount and format, is superior to the selection of data from the nearest STAR station. In the EPA's experience, however, such data sets are very limited and only rarely available. The EPA disagrees that the use of 70 years of meteorological data to obtain average long-term estimates of risk constitutes an improvement over the 1 to 5 years currently used. Even in those few cases in which such a historical record exists, these data could be no more and perhaps less representative than the more recent years.

The EPA does consider the stability of compounds in the assessment of exposure. Data indicate, however, that benzene is relatively stable in the atmosphere and would not degrade to the extent that there would be an appreciable impact on the exposure and risk estimates.

The effect of terrain on the estimation of exposure may vary from site to site. For any one site, the flat terrain assumption may tend to over- or underestimate exposure. In general, the effect of complex terrain is less for emissions released relatively close to the ground than for elevated process vent emissions that have the potential to impact on hillsides or be affected by building downwash. The EPA agrees that for sources located in complex terrain where the surrounding topography is at a higher elevation, exposure may be underestimated; however, the effect may vary by plant and may be relatively small given the low release heights of most of the modeled benzene sources.

Comment: Several commenters advocated the use of monitoring data to verify the concentrations predicted by the EPA's dispersion modeling.

Response: While direct measurement of exposure would appear to be preferable to modeling, it is not feasible as a routine procedure in NESHAP development. Factors affecting the feasibility include cost, time, background concentrations of pollutants, and availability of sufficiently sensitive analytical methods. In particular, it is neither economically nor technically feasible to determine or verify benzene exposure in the vicinity of emitting facilities. It would require siting large numbers of monitors near each plant to establish concentrations to which all persons living near the sources are exposed.

Exposure will vary with distance and direction from the plant and the monitoring results could be potentially confounded by background levels or contribution from other benzene sources. In addition, monitoring data do not offer a means of predicting future ambient concentrations resulting from promulgation of a standard. Atmospheric dispersion models can be used to estimate the directional variations in exposure and to predict exposure under various emissions control scenarios.

In summary, EPA believes that routine, extensive collection of monitoring data to verify or substitute for dispersion modeling of emissions does not represent a feasible approach to assessing exposure to benzene. Where monitoring data are available, however, EPA does consider such information in its deliberative process.

Comment: Several comments on the benzene exposure analysis, particularly the matching of exposure with population, pertained to the level of analysis and the need for more and better data. Commenters expressed concern that the EPA's frequent assumption of plant fencelines being a uniform 200 meters from the plant center tended to overestimate maximum risk. Suggestions included the use of more source specific information including actual locations of residences and plant boundaries, and more recent census data. Other commenters favored the use of the maximum offsite concentration for risk estimation, independent of the proximity of residences.

Response: The EPA has used the 200-meter fenceline assumption routinely to facilitate comparison of the MIR among sources and source categories. Changes in this assumption have very little impact upon estimates of population risk (annual incidence) but can significantly affect the MIR since this measure of risk is normally predicted close to the plant. Individual plant boundary information, however, is not readily available and is often difficult to obtain. Sensitivity analyses indicate that while the 200-meter assumption may result in an overestimate of the MIR in some cases, there are also cases where the risk may be underestimated.

The choice of less sophisticated analyses and need for simplifying assumptions most often results from the lack of source-specific data. The collection of such data, which would facilitate more detailed assessments, is usually prohibitively expensive. The EPA believes that, in such circumstances, assumptions such as the 200-meter fenceline are a reasonable and appropriate surrogate.

The use of maximum offsite concentration is an alternative but also requires determination of actual or estimated plant boundaries and does not address the issue of habitability. To require that one or more residences exist at the point of modeled maximum concentration, however, places undue emphasis on the capability of the model to predict that a specific concentration will occur at a specific location. The EPA regards the models as accurate to the extent that the predicted maximum concentration can be expected to occur in the vicinity of the plant. The EPA concludes that while a rough check of the habitability of the area may be advisable, insistence on the verification of residences at the specific concentration point is not technically defensible.

Comment: One commenter suggested that the matching of exposure with population in the benzene assessment would be improved by incorporating daily human activity patterns similar to the modeling approach taken in the development of the EPA's National Ambient Air Quality Standards (NAAQS).

Response: The EPA has consistently taken the position that the models used to estimate exposure and risk should be commensurate with the quality and amount of data available. The NAAQS Exposure Model (NEM) has been used by EPA exclusively for criteria air pollutants. Extensive national monitoring networks are established for these criteria air pollutants that facilitate the identification and evaluation of micro-environments representative of daily activities. Comparable data are not available for benzene and the gathering of such data for the much larger universe of toxic pollutants would be infeasible.

In addition, the health effects associated with exposure to the criteria pollutants are different from those attributable to benzene. In the criteria program there is a greater emphasis on the potential for effects from shorter term exposure and a greater need to evaluate the potential for such exposures. Cancer, in contrast, is generally viewed as a chronic disease in which cumulative dose is the principal factor in risk estimation.

While EPA agrees that the incorporation of human activity data would represent an analytical improvement, this increase in sophistication is not commensurate with the presently available data, the nature of the effects evaluated, and the underlying uncertainties in estimating cancer risks from exposure to benzene.

Uncertainty in Risk Estimates

Comment: A number of commenters argued that the scientific and statistical uncertainties of the risk estimates should be identified and quantified to the extent possible. Several of these commenters recommended the use of specific procedures such as Monte Carlo simulation to develop a best estimate of the MIR, rather than what they viewed as the EPA's "worst-case" estimate.

Response: The EPA has long recognized and attempted to communicate the fact that quantitative risk estimates contain inherent uncertainties. Uncertainties arise in all stages of the analysis due to the fact that the relevant data and understanding of the processes are not complete nor perfectly accurate and precise. Where data gaps exist, qualitative and quantitative assumptions are made based on our present understanding of the biological mechanisms of cancer causation, estimates of air dispersion, engineering estimates, and other factors. Because of the nature as well as the number of assumptions made, EPA has in previous rulemakings only attempted to quantify part of the uncertainties or to describe the uncertainties qualitatively. (When only part of the uncertainty for quantitative risk estimates has been presented, EPA has found this to be somewhat misleading because this part of the uncertainty can be construed as representing the total uncertainty. On the other hand, compounding of the individual uncertainties can obscure the importance of particular uncertainties.)

The comments arguing for quantification of the uncertainty caused EPA to take a fresh look at the uncertainties in risk estimates. The objective of this review was to determine whether there are ways to portray the sensitivity of the risk estimates to changes in assumptions or ways to quantify the uncertainty. In doing so, the risk calculation procedures were reviewed and key parameters that significantly affected the estimates were identified. The feasibility of quantifying the uncertainties was assessed considering the availability of information on the range and distribution of values for the key parameters. In the absence of such data, any simulation of the combined uncertainties would be misleading in that it would create an impression of more knowledge and understanding than is presently feasible.

The conclusion drawn from the assessment was that for most steps in the risk assessment there is insufficient information on the expected range and

statistical distribution of possible values. For other steps there are no data to define the uncertainty. Examples of the information needed for quantification of uncertainty for benzene, but *unavailable*, are:

(1) The variability in individual susceptibility to cancer within the U.S. population;

(2) Data to define the response at low dose levels and the uncertainty of those measures (rather than extrapolation from high dose levels);

(3) The distribution of actual emission rates and the uncertainty of those; and

(4) The error introduced by not using site-specific meteorological data and the variability of that error. (Dispersion modeling was done using meteorological data from the nearest recording weather station.)

For the benzene risk assessments, the information needed for simulation of the combined uncertainty is simply not available. Moreover, some of these data gaps cannot be filled at the present state of understanding of biological effects or with reasonable expenditures of time and resources.

There are a number of parameters that can substantially increase or decrease the estimated risk. It was concluded that on balance overall the risk estimates are plausible and do not represent the worst case. This conclusion was drawn recognizing that the assumption of a 70-year, 24-hour per day exposure adds a degree of conservatism. This assumption is considered plausible since a small proportion of the U.S. population (0.04 percent, or 100,000 people) does spend a lifetime in a single geographic area. A more detailed discussion of the analysis of the feasibility of quantifying the uncertainty for the benzene risk assessments is presented in the BID.

Technical Comments, Responses, and Changes

Coke By-Product Recovery Plants: Several comments were received from industry that are specific to the regulatory analysis for coke by-product recovery plants. A synopsis of the major comments and the EPA's responses on the emission estimates and control techniques is given here. More detailed comments and responses on these topics and on the cost estimates are in the BID.

Comment: Several commenters supplied specific information regarding permanent plant or battery closures and changes in plant processes. They requested that the data base and analyses be updated to reflect these changes.

Response: The EPA agreed to update the analysis to remove plants and coke

oven batteries that have been permanently closed or demolished. In addition EPA deleted batteries that are on cold-idle and would require substantial construction or a pad-up rebuild before restarting. Batteries that are on cold-idle but may reopen or would be able to operate in their current condition were retained in the analysis, as were batteries on hot-idle. Changes in plant processes were also incorporated. The EPA also included other information that was readily available and easily incorporated into the analysis, such as more accurate geographical coordinates for some of the plants. This information was recently gathered by EPA for the NESHAP being developed for coke oven emissions. More detailed information on the revisions to the data base can be found in the BID.

Comment: Several of the commenters from the industry believe that the emission factors for particular emission points are too high. They suggested that emissions from process vessels and storage tanks for which gas blanketing was proposed should be estimated using the equations in the EPA document, "Compilation of Air Pollutant Emission Factors, AP-42" for tanks storing volatile organic liquids. These tanks include tar decanters, tar storage tanks, flushing-liquor circulation tanks, and wash-oil circulation tanks and decanters.

Response: The purpose of the AP-42 equations is to estimate working and breathing losses for fixed roof tanks storing volatile organic liquids. According to AP-42, fixed roof tanks are commonly equipped with a pressure/vacuum valve that allows them to operate at a slight internal pressure or vacuum to prevent the release of vapors during very small changes in temperature, pressure, or liquid level. The introduction to the emission equations in section 4.3.2 of AP-42 (September 1985) for fixed roof tanks states that they apply only to vessels that are substantially liquid and vapor-tight and that operate at approximately atmospheric pressure. Assuming that the vessels meet the AP-42 criteria, application of the equations may be appropriate for some vessels at a particular coke by-product recovery plant. However, many of the vessels of the type noted by the commenters cannot be considered liquid and vapor-tight. The vessels at many plants have permanently open vents with no pressure/vacuum relief valves. Many of them have only partial covers or no covers, and have supplemental vents in tank sidewalls that allow wind to pass through the vessels. Also, vessels at

several of the plants are in need of repair, with warped covers on access hatches or openings at the roof's edge. Thus, application of the AP-42 equations would be inappropriate for nationwide emission estimates.

Furthermore, the emission mechanisms of the vessels in the tar processing area of the plant also are such that the equations are not appropriate for nationwide emission estimates. For example, tar storage and tar dewatering tanks are heated in many cases to remove water, which increases the flow and concentration of emissions; this situation is not accounted for by the AP-42 equations. The liquids in tar decanters and other sources also contain dissolved gases that are emitted from the vessels (in addition to working and breathing losses). The AP-42 methodology does not estimate emissions from generation of water vapor or dissolution of gases from these tanks. The field testing performed as the basis of the EPA emission factors for these vessels included direct measurement of vapor phase concentrations and flow rates. Estimates by AP-42 for these vessels would tend to underestimate emissions.

Equations based on the same principles as those in AP-42 were used to develop the emission factor for storage tanks containing light-oil, BTX mixtures, or benzene. These vessels tend to be covered and sealed to prevent product loss. In addition, the liquids in these vessels are pure, as in the case of refined benzene, or like BTX, are mixtures of constituents with well-known vapor pressures. The AP-42 equations can be applied with more accurate results for these conditions than for the nonhomogeneous mixtures contained in other types of vessels.

Comment: Comments received from some members of the affected industry raised concerns regarding the safety of coke oven gas-blanketing systems. They believe that the blanketing system would increase worker risk, the risk of overpressure or underpressure of vessels, and the severity of potential fires or explosions.

Response: The EPA has worked with the industry and independent experts over the past 10 years to understand the features of gas blanketing systems already installed and to include features in the cost analysis for safe and effective operation. The system costed by EPA as the basis of the standards includes such features as: flame arrestors; an atmospheric vent on the collecting main or gas holder to relieve excess pressure; three-way valves to lower the possibility of operator error;

and steam-traced lines with drip points, condensate traps, and steam-out connections to reduce plugging problems. The EPA also has included provisions in the standards such as an annual maintenance check, to ensure proper operation and maintenance once a system is installed, and believes that adherence to these provisions will reduce or eliminate factors that cause unsafe conditions.

Coke oven gas-blanketing has been applied to process vessels at seven plants, one of which used it at both by-product plants within the main plant. While gas blanketing has been applied to only a few vessels at some plants, it has been widely applied throughout the plant at others. Not all of the systems have included the safety features that EPA included in its cost analysis. No specific safety or operational problems have been reported to EPA that routine maintenance would not resolve.

The EPA carefully reviewed the report submitted by the commenters in support of their concerns. After its evaluation EPA concluded that, with proper design, operation, and maintenance, coke oven gas-blanketing does not pose the degree of safety problems alleged in the report. The specific points raised by the commenters are addressed in detail in the BID.

Finally the standards provide flexibility in the design of the system. For example, additional features to enhance the safety can be included, such as the purge system noted by some of the commenters. Also, other blanketing gases, such as nitrogen, may be used. The use of another gas may reduce or eliminate some of the commenters' concerns. The EPA approximated the cost of a nitrogen blanketing system to be roughly 20 to 75 percent higher than a coke oven gas-blanketing system.

Benzene Storage Vessels: As discussed previously in this notice, the storage standards selected for promulgation were the same as those proposed under Approaches A, B, and C. Technical comments on and changes to the proposed regulation are discussed in the response below. Additional comments and detailed responses are contained in the BID.

Comment: Comments were received on storage technical issues and wording of the proposed standards. Some commenters addressed specific provisions of the standards. They are noted in the response where the respective provisions are discussed. Other commenters requested general consistency between the benzene standards and the standards in 40 CFR part 60 Subpart Kb for new vessels

storing VOL. While considering these comments, EPA also thoroughly reviewed the regulations proposed under the various policy approaches for any inconsistencies within the proposed benzene standards or with Subpart Kb, where appropriate.

Response: One change to the regulatory language clarifies that, as stated in the preamble to the proposed benzene standards, existing IFR vessels with shingled seals would have to be retrofitted with continuous primary seals (either liquid-mounted, vapor-mounted primary with a continuous secondary seal, or mechanical shoe). This has been clarified by changing the wording in § 61.271(a)(2) to limit the exclusion of existing vessels equipped with IFR's to only those IFR vessels equipped with continuous seals. A definition of a continuous seal has also been provided.

This clarification is necessary to bring the regulation into conformity with the intention stated in both the preamble to the proposed regulation (53 FR 28541) and in section III of this notice, to require that all vessels must be equipped with continuous seals. The estimated residual risks presented in the proposal preamble and the estimated residual risks after application of the controls required by the promulgated standards are the same. These estimates reflect the replacement of shingled seals with continuous seals.

Another change is the deletion of § 61.271(a)(6) of the proposed regulation which provided that owners or operators of IFR vessels with secondary seals did not have to install certain fittings such as gasketed covers on all openings in the IFR. This change means that all IFR vessels must be equipped with the fittings required in § 61.271(a)(5). This change will have an impact on only those vessels equipped with secondary seals, and the addition of these fittings will result in an estimated additional reduction of 0.07 Mg/yr for an affected "typical" IFR vessel with a volume of 605,000 liters (160,000 gallons), and a diameter of 9.1 meters (30 feet). The annualized cost of retrofitting these fittings at first degassing, \$46/year (1982 dollars) was considered reasonable for any IFR vessel. This change is consistent with 40 CFR part 60 subpart Kb, which requires all vessels to have controlled fittings.

A specific comment was that existing vessels with noncontact IFR's should be allowed to wait until the first degassing to comply with the requirement for each opening in the roof to have a projection that extends below the liquid surface rather than being required to comply within 90 days as proposed in

§ 61.271(a)(8). This provision, in § 61.271(a)(4) in the final standards, has not been changed. The American Petroleum Institute (API) publication, "Evaporation Loss from Internal Floating-Roof Tanks," presents general descriptions of the components in use for IFR vessels (Docket No. A-80-14, Item IV-H-4). This publication describes two basic designs including noncontact floating roof decks, and both of these designs are provided with projections that extend below the liquid surface wherever penetrations occur in the deck. The 2519 test series upon which the emission estimates for these vessels are based used a noncontact IFR with such projections as well. The EPA considers the noncontact deck provided with projections extending below the liquid surface at each opening to be the typical configuration. The intent of this requirement in the regulation is to ensure that vessels with noncontact IFR's conform with the typical baseline level of control. Therefore, it is unnecessary and unreasonable to allow a delay in compliance with this requirement.

The provisions for repair of damaged seals were reviewed and revised in response to comments. One commenter favored delay of repair of damaged seals detected during the annual visual inspection of IFR vessels until the first degassing. After considering the comments, § 61.272(a)(2)(ii) of the proposed standards was deleted. In the proposed standards, conflicting requirements for the repair of damage to seals were given in §§ 61.272(a)(2)(i) and 61.272(a)(2)(ii), with (i) allowing a 30-day repair period with a possible 30-day extension, and (ii) allowing repair to be delayed until the first degassing. However, in the final standards, this section and other sections dealing with repair of damaged seals allow 45 days for repair (instead of 30 days), with the opportunity to request a 30-day extension if repair within 45 days is not feasible. These changes will make the repair period in the benzene regulation consistent with the standards for VOL storage tanks (40 CFR part 60 subpart Kb). The reason that Subpart Kb has a 45-day (versus 30-day) repair period is that in the event that special materials not normally kept in stock by suppliers were needed; 30 days may be insufficient for repair of this equipment. The same situation would exist for vessels subject to the benzene rule. Therefore, EPA determined that it was reasonable to make this rule consistent with subpart Kb. In response to the commenter's request for a delay of repair until the first degassing, EPA

would like to point out that the annual visual inspection and the associated repair requirements are mandatory only for IFR vessels equipped with only a primary seal. Since single-seal IFR vessels are only required to be degassed and inspected internally once every 10 years, excess emissions resulting from a damaged seal on such a vessel might go unrepaired for 10 years if the repair may be delayed until degassing.

Benzene Equipment Leaks: The majority of comments received on equipment leaks concerned the emission estimates and the feasibility of demonstrating compliance with mass emission standards. These comments are discussed in this section and are discussed in more detail in the BID. The BID also addresses additional minor comments on the wording of the proposed standards and cost estimates.

Comment: Several commenters thought that the EPA's estimate of benzene emissions for equipment leaks was even more overstated than EPA believed. The reasons cited by the commenters included: (1) The estimate assumed a higher percentage of leaking components than is actually found in the chemical industry; (2) the estimate assumed higher rates for both leaking and nonleaking components than are actually found in the chemical industry; (3) the estimate does not accurately reflect the extent to which effective control components are used in the chemical industry; and (4) the estimates derived from industry average factors should not be used to estimate emissions from facilities handling toxic chemicals and complying with low OSHA exposure limits. The commenters referenced several studies in support of these points, and one commenter thought EPA should have developed more realistic estimates of emissions from equipment leaks.

Response: In the July 28, 1988, notice (53 FR 28496) EPA discussed many of the same concerns expressed by the commenters and indicated that this overstatement was a consideration in the proposed decision under Approach A. No quantitative estimates of the overstatement, or the bias, were presented at proposal because of the limited data available. To address the primary concern of the commenters, EPA reviewed available information sources to see if any improvements to the estimates could be developed. This assessment is summarized below, and the other concerns of the commenters are addressed in the BID.

To consider a representative sample of current performance, EPA examined compliance reports from 1987 and 1988 for a randomly-selected sample of 25

facilities operating about 40 process units subject to the benzene NESHAP. Many of these units had no leaking pumps or valves (i.e., a leak frequency of 0.0 percent), and the average leak frequencies were 0.27 percent for valves and 2.3 percent for pumps. These leak frequencies are lower than the average expected leak rates of 3 to 5 percent for valves and roughly 10 percent for pumps.

In addition to the compliance reports for facilities subject to the existing NESHAP, EPA also reviewed a limited amount of comprehensive data for several process units with equipment in benzene service. For these units, the measured concentration showed emission rates that were 20 to 30 times lower than would be predicted using the EPA's estimation procedures.

Data for other air toxics show a similar pattern. Specifically, recent comprehensive studies on process units handling butadiene, ethylene oxide, or phosgene indicate average leak frequencies of 0 to 5 percent and emission ratios that are a factor of 5 to 20, or more, lower than the EPA's estimates.

Although this information provides an indication of the magnitude of the bias in the emission estimates, it is not a sufficient basis for developing emission factors that would be generally applicable to all facilities. This occurs because leak frequency and the associated emission rates vary widely among facilities and are believed to be a function of original design, age of the process unit, equipment used, quality of the maintenance, and motivation. Development of less biased emission estimates requires information that is not available at this time and that can only be obtained through an extensive study of the industry. Consequently, EPA has not been able to develop better estimates and the emission estimates remain as presented in the proposal notice.

Comment: A number of industry representatives commented that significant further reductions in emissions from equipment leaks cannot be achieved without the development of new technology. The specific concerns raised by the commenters included: (1) The feasibility of applying specific equipment (e.g., dual mechanical seal pumps in corrosive duty) to all types of facilities with equipment in benzene service, and (2) the actual emission reductions achieved by sealed bellows valves. In contrast, one commenter, an equipment vendor, estimated existing sealed bellows valves could be applied to 80 or 85 percent of the process valves in a typical unit.

Response: The EPA agrees that significant reductions beyond the existing standards will require much better understanding of factors affecting emissions than is presently available. Because of this and the need to ensure compliance with specific emission levels, EPA sees the need for a new regulatory approach, based on performance and/or emissions, that will result in quantifiable emission levels, give credit for original plant design, and motivate innovation. The EPA has initiated a negotiated rulemaking to address technical questions regarding performance of control measures or equipment specifications (54 FR 17944, April 25, 1989).

Regarding the commenters' specific points on the applicability of sealed bellows valves, information available to EPA continues to support the conclusion that while sealed bellows valves are useful in some situations, they are not universally applicable and thus will not eliminate all benzene emissions from valves (Docket No. A-79-27, Item VII-A-2). Some of the considerations which have limited the applicability of sealed bellows valves are variability of service life, corrosion and mechanical failure in service with corrosive chemicals, significant emissions when the bellows fail, and limits on pressure and temperature of service streams.

V. Detailed Summary of Final Standards and Impacts

No standards are promulgated for maleic anhydride or EB/S process vents. No additional standards are promulgated for benzene equipment leaks beyond those contained in 40 CFR part 61 subpart J. The final standards for coke by-product recovery plants and benzene storage vessels and the associated health, environmental, energy, cost, and economic impacts are summarized below.

Coke By-Product Recovery Plants

Summary of Standards: The regulations in 40 CFR part 61 subpart L establish equipment standards for the control of emissions from each tar decanter tar dewatering tank tar-intercepting sump, tar storage tank, flushing-liquor circulation tank, light-oil condenser, light-oil decanter wash-oil decanter, and wash-oil circulation tank. These standards also apply to storage tanks containing benzene, BTX, light-oil or excess ammonia-liquor at furnace coke by-product recovery plants. "Furnace coke" and "foundry coke" are defined in the regulations to identify plants subject to controls for these storage tanks. Each of these sources are

required to be totally enclosed with emissions ducted to the gas collection system gas distribution system, or other enclosed point in the by-product recovery process. Unless otherwise specified pressure-relief devices, vacuum-relief devices, access hatches, and sampling ports are the only openings allowed on each source. Access hatches and sampling ports must be equipped with a gasketed cover.

The standards for these sources are achievable with the use of a gas blanketing system. A gas blanketing system is a closed system operated at positive (or negative) pressure and is generally composed of piping connections, and flow-inducing devices (if necessary) that transport emissions from the enclosed source back to the coke-oven battery gas holder, the collecting main, or another point in the by-product recovery process. Dirty or clean coke oven gas, nitrogen, or natural gas are examples of gases that may be used as the gas blanket.

To ensure proper operation and maintenance of the control equipment, subpart L requires a semiannual inspection of the connections and seals on each gas blanketing system for leaks, using EPA Method 21 (40 CFR part 60 appendix A). Monitoring also is required at any time after the control system is repressurized following removal of the cover or opening of any access hatch. For the gas blanketing system, an organic chemical concentration of more than 500 ppm by volume above a background concentration indicates the presence of a leak. The standards also require a semiannual visual inspection of each source and the piping of the control system for visible defects such as gaps or tears. A first attempt at repair of each leak or visible defect is required within 5 days of detection with repair within 15 days. The owner or operator is required to record the results of the inspections for each source and to include the results in a semiannual report. The standards also require an annual maintenance inspection for abnormalities such as pluggages sticking valves, and clogged or improperly operating condensate traps. A first attempt at repair is required within 5 days and any necessary repairs are to be made within 15 days of the inspection.

Equipment standards also are established for the control of emissions from light-oil sumps. The standards require that the surface area of each sump be completely enclosed. These standards are based on the use of a

tightly fitting permanent or removable cover, with a gasket on the rim of the cover. The standards allow the use of an access hatch and a vent in the sump cover. However any access hatch must be equipped with a gasket and with a cover or lid, and any vent must be equipped with a water leg seal, pressure-relief device, or vacuum-relief device. Semiannual inspections of the gaskets and seals for detectable emissions is required; monitoring also is required at any time the seal system is disturbed by removal of the cover. The inspection and monitoring requirements are the same as previously described for gas-blanketed sources. The standards do not allow venting of steam or gases from other points in the coke by-product process to the light-oil sump.

For furnace and foundry coke by-product plants, the standards for naphthalene processing operations, final coolers, and the associated cooling towers require zero emissions from the final cooler and cooling tower as well as from naphthalene processing. These standards are based on the use of a wash-oil final cooler; however, other final cooler designs that achieve the emission limit can be used.

The standards also apply to leaks (i.e., fugitive emissions) from new and existing pieces of equipment in benzene service, including pumps valves exhausters pressure-relief devices sampling connections, and open-ended lines, all of which except exhausters comprise those components that contact or contain materials having a benzene concentration of at least 10 percent by weight. Exhausters that contact or contain materials having a benzene concentration of at least 1 percent by weight also are in benzene service. Because the standards for equipment leaks are the same as the requirements in 40 CFR 61 Subpart V, for equipment except exhausters, Subpart L for coke by-product recovery plants references Subpart V where appropriate rather than repeating the provisions. Subpart V also has been amended where necessary for clarification of the cross referencing. The specific requirements for exhausters are summarized in detail below, because they are not in Subpart V.

The standards require that all exhausters in benzene service be monitored quarterly for the detection of leaks. If an organic chemical concentration at or above 10,000 ppm is detected, as measured by Method 21 the standards require a first attempt at repair within 5 days, with repair of the leak within 15 days from the date the

leak was detected, except when repair would require a process unit shutdown. "Repair" means that the measured concentration is below 10,000 ppm. The standards provide three types of alternatives to the leak detection and repair requirements for exhausters. An owner or operator may: (1) Use "leakless" equipment to achieve a "no detectable emissions" limit (i.e., 500 ppm above a background concentration, as measured by Method 21) (2) equip the exhauster with enclosed seal areas vented to a control device designed and operated to achieve a 95-percent benzene control efficiency, or (3) equip the exhauster with seals having a barrier fluid system. Specific requirements for each of these three alternatives to the leak detection and repair program also are included in the regulation.

Compliance with the standards will be assessed through plant inspections and the review of records and reports that document implementation of the requirements. On a semiannual basis, the owner or operator is required to report the number of leaks detected and the number of leaks not repaired during the 6-month period. The owner or operator also is required to submit a signed statement in each semiannual report, indicating whether provisions of the standards have been met for the 6-month period.

Summary of Environmental, Health, and Energy Impacts: The EPA estimates that the standards will reduce nationwide benzene emissions from 36 coke by-product recovery plants by about 16,500 Mg/yr, a reduction of 97 percent from the baseline level of about 17,000 Mg/yr. Nationwide emissions of volatile organic compounds (including benzene) from these plants would be reduced by about 116,000 Mg/yr (or by about 99 percent) from the baseline level of about 117,000 Mg/yr. Implementation of the standards is expected to reduce the annual leukemia incidence associated with nationwide benzene emissions from these plants from 1 case every 6 months (2 cases/year) at the baseline level to about 1 case every 20 years (0.05 case/year) a reduction of 97 percent. The MIR would be reduced from about 7×10^{-3} at baseline to about 2×10^{-4} .

Implementation of the standards is expected to result in a national energy savings of approximately 14,500 terajoules (TJ)/yr from recovered coke oven gas, assuming recovery of at least 16 liters of gas/min/Mg of coke/day at furnace plants and 12 liters of gas/min/Mg of coke/day at foundry plants.

Although an increased cyanide concentration in wastewater is expected with the use of indirect cooling instead of direct final cooling at coke by-product plants, the increase (about 200 g/Mg of coke) is not anticipated to cause problems for compliance with effluent regulations.

Summary of Cost and Economic Impacts: The nationwide capital cost of the standards for furnace and foundry plants combined is estimated at about \$74 million (1984 dollars); nationwide annual costs are estimated at \$16 million/yr.

The increase incurred in the price of furnace and foundry coke as a result of the standards is estimated to be less than one percent. The EPA's economic analysis indicates that at baseline, several plants may have marginal costs of operation greater than the price of coke. The analysis predicts that implementation of the standards may add one more plant to this group. However, a company decision to actually close a plant is based on a number of factors that an economic model cannot consider, including: the premium a plant is willing to pay for a secure, captive coke supply; requirements for a particular coke quality; age of the batteries, foundry, or steel mill; continued access to profits from steel production; and management's perception regarding their future costs and revenues. The EPA recognizes that implementation of the standards could be the factor that would trigger closure decisions at plants that are presently marginal or operating at a loss.

Benzene Storage Vessels

Summary of the Standards: The final standards, in 40 CFR 61 Subpart Y, are most similar to the standards proposed for benzene storage vessels under proposed policy Approaches A, B, and C. The standards require control of all new and existing storage vessels greater than or equal to 38 m³ (10,000 gallons) used to store benzene meeting the specifications incorporated by reference in § 61.270(a) for industrial grade benzene or refined benzene-485, -535, or -545. The standards do not apply to storage vessels used for storing benzene at coke by-product recovery facilities because they are considered under the coke by-product recovery plants NESHAP. The standards require use of certain kinds of equipment on each type of benzene storage vessel. Table 2 lists the requirements.

TABLE 2.—EQUIPMENT REQUIRED ON BENZENE STORAGE VESSELS BY 40 CFR PART 61 SUBPART Y

Vessel size and time of construction	Requirements
1. Fixed roof IFR vessel	
a. >38 m ³ , commenced construction after July 28, 1988; or >38m ³ , commenced construction prior to July 28, 1988, and had no IFR, or had an IFR without a continuous seal as of July 28, 1988.	IFR with liquid-mounted or mechanical shoe continuous primary seal ¹ and gasketed roof fittings.
b. >38 m ³ , commenced construction prior to July 28, 1988, and had an IFR as of July 28, 1988.	IFR with a continuous seal ² and gasketed roof fittings. ³
2. EFR vessel	
a. >38 m ³ , commenced construction after July 28, 1988; or >38m ³ , commenced construction prior to July 28, 1988, and did not have a liquid-mounted primary seal as of July 28, 1988.	Liquid-mounted or mechanical shoe primary seal and a continuous secondary seal.
b. >38 m ³ , commenced construction prior to July 28, 1988, and had a liquid-mounted primary seal as of July 28, 1988.	Liquid-mounted primary seal and a continuous secondary seal. ⁴

¹ A vapor-mounted primary seal is also allowed, provided that the vessel is also equipped with a continuous secondary seal.

² For example, liquid-mounted, vapor-mounted, or mechanical shoe seals are allowed.

³ Gasketing of roof fittings is required the first time the vessel is degassed.

⁴ The secondary seal is required the first time the vessel is degassed.

The benzene storage vessel standards require that fixed roof vessels include an IFR with a continuous seal and gasketed roof fittings. Specifically, the standards require that new fixed roof vessels and existing fixed roof vessels to which an IFR was added after July 28, 1988, must have IFR's with either: (1) A liquid-mounted continuous seal, (2) a vapor-mounted primary seal, with a secondary seal, both of which are continuous, or (3) a mechanical shoe seal. These vessels are also required to have gasketed roof fittings, even if they have a secondary seal. These requirements must be met before vessel-filling for new vessels or within 90 days of the effective date of this regulation for existing vessels. Existing fixed roof vessels that already had IFR's on July 28, 1988, and have vapor-mounted primary seals are not required to add secondary seals or to have their vapor-mounted seals replaced with liquid-mounted seals. However, existing shingled seal IFR vessels are required to replace their shingled seal with a continuous seal within the 90-day compliance period. All vessels with IFR's prior to July 28, 1988, are also required to have gasketed fittings, even if they have secondary seals. However,

for these existing vessels, the fittings can be retrofitted at the first degassing or within 10 years (whichever is first).

Owners of existing and new EFR vessels are required to install liquid-mounted primary seals (or mechanical shoe seals) and continuous secondary seals meeting certain gap requirements. For new vessels, these requirements must be met before vessel-filling. For existing vessels that did not have liquid-mounted primary seals as of July 28, 1988, they must be met within 90 days of the effective date of this regulation. Existing EFR vessels already equipped with a liquid-mounted primary seal as of July 28, 1988, are required to add the secondary seal at the first degassing of the vessel. However, those with other types of primary seals (e.g., vapor or mechanical shoe) must add the required types of primary and secondary seals within 90 days of the effective date of this regulation.

The standards require that each IFR vessel be inspected from inside prior to the filling of the vessel (if it is a new vessel or is emptied to install control equipment) and at least once every 10 years. An IFR having defects or a seal having holes or tears would have to be repaired before filling the storage vessel with benzene. The standards also require that the IFR and its seal be inspected through roof hatches on the fixed roof at least once annually. However, if an IFR were equipped with a primary and secondary seal, the owner or operator could conduct an internal inspection every 5 years rather than perform the annual inspections. Any defects such as roof sinking, liquid on the deck, holes or tears in the seal, or primary seal detachment (or secondary seal detachment, if one is in service) as viewed through the roof hatches are required to be repaired within 45 days or the storage vessel would have to be emptied. If repair within 45 days is not possible, and alternate storage is not available to allow the tank to be emptied, the owner or operator could request an extension of up to 30 additional days.

The standards also require that, for EFR vessels, the primary seal and secondary seal gaps be measured initially and at least once every 5 years for the primary seal and at least once annually for the secondary seal. Conditions not meeting the standards which are identified during these inspections must be repaired within 45 days or the vessel would have to be emptied. An extension of up to 30 days may be requested if the repair is not possible within the 45 days allowed.

Summary of the Environmental, Health, and Energy Impacts: Under the standards summarized above, benzene emissions from this source category are estimated to be reduced from the baseline range of 620 to 1,290 Mg/yr to a level of 510 Mg/yr. The residual incidence of leukemia from exposure to benzene emissions after application of the standards is estimated to be 1 case every 25 years (0.04 case/year), and the MIR is predicted to be 3×10^{-5} . This can be compared with an incidence range of 1 case every 10 to 20 years (0.1 to 0.05 case/year) and an MIR range of 4×10^{-5} to 4×10^{-4} under the baseline conditions.

Because the control equipment and work practices required by the standards do not involve the generation of any wastewater or solid waste, there are no expected impacts on water quality or solid waste disposal. Further, no noise or radiation impacts are expected, nor are any changes in energy use predicted.

Summary of the Cost and Economic Impacts: National capital costs of control associated with achieving the standards are \$0.66 million (1982 dollars). The nationwide annual cost is \$0.1 million/yr (1982 dollars). No major adverse economic impacts are anticipated as a result of these standards.

VI. Administrative

Paperwork Reduction Act

The information collection provisions associated with the rules have been approved by the Office of Management and Budget (OMB) under the Paperwork Reduction Act (PRA) of 1980, 44 U.S.C. 3501 et seq. and have been assigned OMB Control Number 2060-0185.

During the first 3 years that the standards are in effect, the public reporting burden for collection of information, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information is estimated to be:

- (1) 2,134 averaged annual hours with an average of 17 hours/year per respondent for plants with benzene storage vessels; and
- (2) 5,835 averaged annual hours with an average of 162 hours/year per respondent for coke by-product recovery plants.

No new standards are being promulgated for EB/S process vents and equipment leaks, therefore, there are no associated recordkeeping and reporting burdens. The existing standards for benzene equipment leaks will remain in effect. Consequently, there is no change

in the reporting and recordkeeping burden.

Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) (5 U.S.C. 601 et seq.) requires EPA to consider potential impacts of proposed regulations on small "entities." If a preliminary analysis indicates that a proposed regulation would have a significant economic impact on 20 percent or more of small entities, then a regulatory flexibility analysis must be prepared.

Present RFA guidelines indicate that an economic impact should be considered significant if it meets one of the following criteria:

- (1) Compliance increases annual production costs by more than 5 percent;
- (2) Compliance costs as a percentage of sales for small entities are at least 10 percent more than compliance costs as a percentage of sales for large entities;
- (3) Capital costs of compliance represent a "significant" portion of capital available to small entities, considering internal cash flow plus external financial capabilities; and
- (4) Regulatory requirements are likely to result in closures of small entities.

For EB/S process vents and equipment leaks no additional controls are required, therefore, no small businesses will be adversely affected. For benzene storage vessels, very few businesses would be considered small businesses. According to Small Business Administration guidelines, a small business that manufactures cyclic crudes and cyclic intermediates, pharmaceuticals, and many other chemicals is one that has 750 employees or fewer. Very few of the businesses in the existing industry employ fewer than 750 people. Benzene storage facilities owned by small businesses will not be adversely affected by the standards. In the economic analysis for this standard, the price increase and profitability impacts were estimated for small as well as for larger facilities. The impacts for the small benzene storage facilities were very small (about \$800/year).

For coke by-product recovery plants, EPA has determined under the Small Business Administration guidelines that any coke firm that employs fewer than 1,000 workers is a small business. Six foundry coke firms were identified as being small. The economic analysis for the standards estimates that one plant may exceed criterion (2) above. However, the standards are not subject to the RFA because there is not a substantial number (i.e., 20 percent) of the small businesses that would be adversely affected.

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that the rules for benzene storage vessels and coke by-product recovery plants will not have a significant economic impact on a substantial number of small entities.

Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered by EPA in the development of this rulemaking. The principal purposes of the docket are:

- (1) To allow interested parties to identify and locate documents so that they can participate effectively in the rulemaking process; and
- (2) To serve as the record in case of judicial review (except for interagency review materials [Section 307(d)(7)(A) of the CAA]).

Miscellaneous

As prescribed by section 112 of the CAA, as amended, establishment of today's national emissions standards was preceded by the Administrator's listing of benzene as a hazardous air pollutant on June 8, 1977 (42 FR 29332).

In accordance with section 117 of the CAA, publication of these actions on benzene was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies to the maximum extent practical.

Under Executive Order 12291, EPA is required to judge whether these regulations are "major rules" and therefore subject to certain requirements of the Order. The EPA has determined that the regulations for benzene storage vessels and for coke by-product recovery plants will result in none of the adverse economic effects set forth in Section 1 of the Order as grounds for finding a regulation to be a "major rule." These regulations are not major because:

- (1) Nationwide annual compliance costs are not as great as the threshold of \$100 million;
- (2) The regulations do not significantly increase prices or production costs; and
- (3) The regulations do not cause significant, adverse effects on domestic competition, employment, investment, productivity, innovation, or competition in foreign markets.

The regulations presented in this notice were submitted to OMB for review as required by Executive Order 12291.

Any written comments from OMB to EPA and written EPA responses to those comments are included in the dockets listed at the beginning of today's notice

under "Dockets." These dockets are available for public inspection at the EPA's Air Docket, which is listed in the ADDRESSES section of this preamble.

VII. List of Subjects in 40 CFR Part 61

Asbestos, Benzene, Beryllium, Coke oven emissions, Hazardous substances, Incorporation by reference, Inorganic arsenic, Intergovernmental relations, Mercury, Radionuclides, Reporting and recordkeeping requirements, Vinyl chloride, Volatile hazardous air pollutants.

Dated: August 31, 1989.

F. Henry Habicht,

Acting Administrator.

For the reasons set out in the preamble, Chapter I, Title 40, of the Code of Federal Regulations, Part 61, is amended as follows:

PART 61—[AMENDED]

1. The authority citation for Part 61 continues to read as follows:

Authority: Secs. 101, 112, 114, 116, 301 Clean Air Act as amended (42 U.S.C. 7401, 7412, 7414, 7416, 7601).

2. By adding paragraphs (a)(7), (8), (9), and (10) to § 61.18 of Subpart A—General Provisions as follows:

§ 61.18 Incorporations by reference.

* * * * *

(a) * * *

(7) ASTM D 836-84, Standard Specification for Industrial Grade Benzene, IBR approved _____ (date of publication in the Federal Register), for 61.270(a).

(8) ASTM D 835-85, Standard Specification for Refined Benzene-485, IBR approved _____ (date of publication in the Federal Register), for 61.270(a).

(9) ASTM D 2359-85a, Standard Specification for Refined Benzene-535, IBR approved _____ (date of publication in the Federal Register), for § 61.270(a).

(10) ASTM D 4734-87, Standard Specification for Refined Benzene-545, IBR approved _____ (date of publication in the Federal Register), for § 61.270(a).

3. Subpart L is added as follows:

Subpart L—National Emission Standard for Benzene Emissions from Coke By-Product Recovery Plants

Sec.

61.130 Applicability and designation of sources.

61.131 Definitions.

61.132 Standard: Process vessels, storage tanks, and tar-intercepting sumps.

61.133 Standard: Light-oil sumps.

Sec.

61.134 Standard: Naphthalene processing, final coolers, and final-cooler cooling towers.

61.135 Standard: Equipment leaks.

61.136 Compliance provisions and alternative means of emission limitation.

61.137 Test methods and procedures.

61.138 Recordkeeping and reporting requirements.

61.139 Delegation of authority.

Subpart L—National Emission Standard for Benzene Emissions from Coke By-Product Recovery Plants

§ 61.130 Applicability and designation of sources.

(a) The provisions of this subpart apply to each of the following sources at furnace and foundry coke by-product recovery plants: tar decanters, tar storage tanks, tar-intercepting sumps, flushing-liquor circulation tanks, light-oil sumps, light-oil condensers, light-oil decanters, wash-oil decanters, wash-oil circulation tanks, naphthalene processing, final coolers, final-cooler cooling towers, and the following equipment that are intended to operate in benzene service: pumps, valves, exhausters, pressure relief devices, sampling connection systems, open-ended valves or lines, flanges or other connectors, and control devices or systems required by § 61.135.

(b) The provisions of this subpart also apply to benzene storage tanks, BTX storage tanks, light-oil storage tanks, and excess ammonia-liquor storage tanks at furnace coke by-product recovery plants.

§ 61.131 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act, in Subpart A of part 61, and in Subpart V of part 61. The following terms shall have the specific meanings given them:

"Annual coke production" means the coke produced in the batteries connected to the coke by-product recovery plant over a 12-month period. The first 12-month period concludes on the first December 31 that comes at least 12 months after the effective date or after the date of initial startup if initial startup is after the effective date.

"Benzene storage tank" means any tank, reservoir, or container used to collect or store refined benzene.

"BTX storage tank" means any tank, reservoir, or container used to collect or store benzene-toluene-xylene or other light-oil fractions.

"Coke by-product recovery plant" means any plant designed and operated for the separation and recovery of coal tar derivatives (by-products) evolved

from coal during the coking process of a coke oven battery.

"Equipment" means each pump, valve, exhauster, pressure relief device, sampling connection system, open-ended valve or line, and flange or other connector in benzene service.

"Excess ammonia-liquor storage tank" means any tank, reservoir, or container used to collect or store a flushing liquor solution prior to ammonia or phenol recovery.

"Exhauster" means a fan located between the inlet gas flange and outlet gas flange of the coke oven gas line that provides motive power for coke oven gases.

"Foundry coke" means coke that is produced from raw materials with less than 26 percent volatile material by weight and that is subject to a coking period of 24 hours or more. Percent volatile material of the raw materials (by weight) is the weighted average percent volatile material of all raw materials (by weight) charged to the coke oven per coking cycle.

"Foundry coke by-product recovery plant" means a coke by-product recovery plant connected to coke batteries whose annual coke production is at least 75 percent foundry coke.

"Flushing-liquor circulation tank" means any vessel that functions to store or contain flushing liquor that is separated from the tar in the tar decanter and is recirculated as the cooled liquor to the gas collection system.

"Furnace coke" means coke produced in by-product ovens that is not foundry coke.

"Furnace coke by-product recovery plant" means a coke by-product recovery plant that is not a foundry coke by-product recovery plant.

"In benzene service" means a piece of equipment, other than an exhauster, that either contains or contacts a fluid (liquid or gas) that is at least 10 percent benzene by weight or any exhauster that either contains or contacts a fluid (liquid or gas) at least 1 percent benzene by weight as determined by the provisions of § 61.137(b). The provisions of § 61.137(b) also specify how to determine that a piece of equipment is not in benzene service.

"Light-oil condenser" means any unit in the light-oil recovery operation that functions to condense benzene-containing vapors.

"Light-oil decanter" means any vessel, tank, or other type of device in the light-oil recovery operation that functions to separate light oil from water downstream of the light-oil condenser. A

light-oil decanter also may be known as a light-oil separator.

"Light-oil storage tank" means any tank, reservoir, or container used to collect or store crude or refined light-oil.

"Light-oil sump" means any tank, pit, enclosure, or sump tank in light-oil recovery operations that functions as a wastewater separation device for hydrocarbon liquids on the surface of the water.

"Naphthalene processing" means any operations required to recover naphthalene including the separation, refining, and drying of crude or refined naphthalene.

"Process vessel" means each tar decanter, flushing-liquor circulation tank, light-oil condenser, light-oil decanter, wash-oil decanter, or wash-oil circulation tank.

"Semiannual" means a 6-month period; the first semiannual period concludes on the last day of the last full month during the 180 days following initial startup for new sources; the first semiannual period concludes on the last day of the last full month during the 180 days after the effective date of the regulation for existing sources.

"Tar decanter" means any vessel, tank, or container that functions to separate heavy tar and sludge from flushing liquor by means of gravity, heat, or chemical emulsion breakers. A tar decanter also may be known as a flushing-liquor decanter.

"Tar storage tank" means any vessel, tank, reservoir, or other type of container used to collect or store crude tar or tar-entrained naphthalene, except for tar products obtained by distillation, such as coal tar pitch, creosotes, or carbolic oil. This definition also includes any vessel, tank, reservoir, or container used to reduce the water content of the tar by means of heat, residence time, chemical emulsion breakers, or centrifugal separation. A tar storage tank also may be known as a tar-dewatering tank.

"Tar-intercepting sump" means any tank, pit, or enclosure that serves to receive or separate tars and aqueous condensate discharged from the primary cooler. A tar-intercepting sump also may be known as a primary-cooler decanter.

"Wash-oil circulation tank" means any vessel that functions to hold the wash oil used in light-oil recovery operations or the wash oil used in the wash-oil final cooler.

"Wash-oil decanter" means any vessel that functions to separate, by gravity, the condensed water from the wash oil received from a wash-oil final cooler or from a light-oil scrubber.

§ 61.132 Standard: Process vessels, storage tanks, and tar-intercepting sumps.

(a)(1) Each owner or operator of a furnace or a foundry coke byproduct recovery plant shall enclose and seal all openings on each process vessel, tar storage tank, and tar-intercepting sump.

(2) The owner or operator shall duct gases from each process vessel, tar storage tank, and tar-intercepting sump to the gas collection system, gas distribution system, or other enclosed point in the by-product recovery process where the benzene in the gas will be recovered or destroyed. This control system shall be designed and operated for no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background and visual inspections, as determined by the methods specified in § 61.245(c). This system can be designed as a closed, positive pressure, gas blanketing system.

(i) Except, the owner or operator may elect to install, operate, and maintain a pressure relief device, vacuum relief device, an access hatch, and a sampling port on each process vessel, tar storage tank, and tar-intercepting sump. Each access hatch and sampling port must be equipped with a gasket and a cover, seal, or lid that must be kept in a closed position at all times, unless in actual use.

(ii) The owner or operator may elect to leave open to the atmosphere the portion of the liquid surface in each tar decanter necessary to permit operation of a sludge conveyor. If the owner or operator elects to maintain an opening on part of the liquid surface of the tar decanter, the owner or operator shall install, operate, and maintain a water leg seal on the tar decanter roof near the sludge discharge chute to ensure enclosure of the major portion of liquid surface not necessary for the operation of the sludge conveyor.

(b) Following the installation of any control equipment used to meet the requirements of paragraph (a) of this section, the owner or operator shall monitor the connections and seals on each control system to determine if it is operating with no detectable emissions, using Reference Method 21 (40 CFR part 60, appendix A) and procedures specified in § 61.245(c), and shall visually inspect each source (including sealing materials) and the ductwork of the control system for evidence of visible defects such as gaps or tears. This monitoring and inspection shall be conducted on a semiannual basis and at any other time after the control system is repressurized with blanketing gas following removal of the cover or opening of the access hatch.

(1) If an instrument reading indicates an organic chemical concentration more than 500 ppm above a background concentration, as measured by Reference Method 21, a leak is detected.

(2) If visible defects such as gaps in sealing materials are observed during a visual inspection, a leak is detected.

(3) When a leak is detected, it shall be repaired as soon as practicable, but not later than 15 calendar days after it is detected.

(4) A first attempt at repair of any leak or visible defect shall be made no later than 5 calendar days after each leak is detected.

(c) Following the installation of any control system used to meet the requirements of paragraph (a) of this section, the owner or operator shall conduct a maintenance inspection of the control system on an annual basis for evidence of system abnormalities, such as blocked or plugged lines, sticking valves, plugged condensate traps, and other maintenance defects that could result in abnormal system operation. The owner or operator shall make a first attempt at repair within 5 days, with repair within 15 days of detection.

(d) Each owner or operator of a furnace coke by-product recovery plant also shall comply with the requirements of paragraphs (a)-(c) of this section for each benzene storage tank, BTX storage tank, light-oil storage tank, and excess ammonia-liquor storage tank.

§ 61.133 Standard: Light-oil sumps.

(a) Each owner or operator of a light-oil sump shall enclose and seal the liquid surface in the sump to form a closed system to contain the emissions.

(1) Except, the owner or operator may elect to install, operate, and maintain a vent on the light-oil sump cover. Each vent pipe must be equipped with a water leg seal, a pressure relief device, or vacuum relief device.

(2) Except, the owner or operator may elect to install, operate, and maintain an access hatch on each light-oil sump cover. Each access hatch must be equipped with a gasket and a cover, seal, or lid that must be kept in a closed position at all times, unless in actual use.

(3) The light-oil sump cover may be removed for periodic maintenance but must be replaced (with seal) at completion of the maintenance operation.

(b) The venting of steam or other gases from the by-product process to the light-oil sump is not permitted.

(c) Following the installation of any control equipment used to meet the requirements of paragraph (a) of this

section, the owner or operator shall monitor the connections and seals on each control system to determine if it is operating with no detectable emissions, using Reference Method 21 (40 CFR part 60, appendix A) and the procedures specified in § 61.245(c), and shall visually inspect each source (including sealing materials) for evidence of visible defects such as gaps or tears. This monitoring and inspection shall be conducted semiannually and at any other time the cover is removed.

(1) If an instrument reading indicates an organic chemical concentration more than 500 ppm above a background concentration, as measured by Reference Method 21, a leak is detected.

(2) If visible defects such as gaps in sealing materials are observed during a visual inspection, a leak is detected.

(3) When a leak is detected, it shall be repaired as soon as practicable, but not later than 15 calendar days after it is detected.

(4) A first attempt at repair of any leak or visible defect shall be made no later than 5 calendar days after each leak is detected.

§ 61.134 Standard: Naphthalene processing, final coolers, and final-cooler cooling towers.

(a) No ("zero") emissions are allowed from naphthalene processing, final coolers and final-cooler cooling towers at coke by-product recovery plants.

§ 61.135 Standard: Equipment leaks.

(a) Each owner or operator of equipment in benzene service shall comply with the requirements of 40 CFR 61, Subpart V, except as provided in this section.

(b) The provisions of § 61.242-3 and § 61.242-9 of Subpart V do not apply to this subpart.

(c) Each piece of equipment in benzene service to which this subpart applies shall be marked in such a manner that it can be distinguished readily from other pieces of equipment in benzene service.

(d) Each exhauster shall be monitored quarterly to detect leaks by the methods specified in § 61.245(b) except as provided in § 61.136(d) and paragraphs (e)-(g) of this section.

(1) If an instrument reading of 10,000 ppm or greater is measured, a leak is detected.

(2) When a leak is detected, it shall be repaired as soon as practicable, but no later than 15 calendar days after it is detected, except as provided in § 61.242-10 (a) and (b). A first attempt at repair shall be made no later than 5 calendar days after each leak is detected.

(e) Each exhauster equipped with a seal system that includes a barrier fluid system and that prevents leakage of process fluids to the atmosphere is exempt from the requirements of paragraph (d) of this section provided the following requirements are met:

(1) Each exhauster seal system is:

(i) Operated with the barrier fluid at a pressure that is greater than the exhauster stuffing box pressure; or

(ii) Equipped with a barrier fluid system that is connected by a closed vent system to a control device that complies with the requirements of § 61.242-11; or

(iii) Equipped with a system that purges the barrier fluid into a process stream with zero benzene emissions to the atmosphere.

(2) The barrier fluid is not in benzene service.

(3) Each barrier fluid system shall be equipped with a sensor that will detect failure of the seal system, barrier fluid system, or both.

(4)(i) Each sensor as described in paragraph (e)(3) of this section shall be checked daily or shall be equipped with an audible alarm.

(ii) The owner or operator shall determine, based on design considerations and operating experience, a criterion that indicates failure of the seal system, the barrier fluid system, or both.

(5) If the sensor indicates failure of the seal system, the barrier system, or both (based on the criterion determined under paragraph (e)(4)(ii) of this section), a leak is detected.

(6)(i) When a leak is detected, it shall be repaired as soon as practicable, but not later than 15 calendar days after it is detected, except as provided in § 61.242-10.

(ii) A first attempt at repair shall be made no later than 5 calendar days after each leak is detected.

(f) An exhauster is exempt from the requirements of paragraph (d) of this section if it is equipped with a closed vent system capable of capturing and transporting any leakage from the seal or seals to a control device that complies with the requirements of § 61.242-11 except as provided in paragraph (g) of this section.

(g) Any exhauster that is designated, as described in § 61.246(e) for no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background, is exempt from the requirements of paragraph (d) of this section if the exhauster:

(1) Is demonstrated to be operating with no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background, as

measured by the methods specified in § 61.245(c); and

(2) Is tested for compliance with paragraph (g)(1) of this section initially upon designation, annually, and at other times requested by the Administrator.

(h) Any exhauster that is in vacuum service is excluded from the requirements of this subpart if it is identified as required in § 61.246(e)(5).

§ 61.136 Compliance provisions and alternative means of emission limitation.

(a) Each owner or operator subject to the provisions of this subpart shall demonstrate compliance with the requirements of §§ 61.132 through 61.135 for each new and existing source, except as provided under §§ 61.243-1 and 61.243-2.

(b) Compliance with this subpart shall be determined by a review of records, review of performance test results, inspections, or any combination thereof, using the methods and procedures specified in § 61.137.

(c) On the first January 1 after the first year that a plant's annual coke production is less than 75 percent foundry coke, the coke by-product recovery plant becomes a furnace coke by-product recovery plant and shall comply with 61.132(d). Once a plant becomes a furnace coke by-product recovery plant, it will continue to be considered a furnace coke by-product recovery plant, regardless of the coke production in subsequent years.

(d)(1) An owner or operator may request permission to use an alternative means of emission limitation to meet the requirements in §§ 61.132, 61.133, and 61.135 of this subpart and §§ 61.242-2, -5, -6, -7, -8, and -11 of Subpart V. Permission to use an alternative means of emission limitation shall be requested as specified in § 61.12(d).

(2) When the Administrator evaluates requests for permission to use alternative means of emission limitation for sources subject to §§ 61.132 and 61.133 (except tar decanters) the Administrator shall compare test data for the means of emission limitation to a benzene control efficiency of 98 percent. For tar decanters, the Administrator shall compare test data for the means of emission limitation to a benzene control efficiency of 50 percent.

(3) For any requests for permission to use an alternative to the work practices required under § 61.135, the provisions of § 61.244(c) shall apply.

§ 61.137 Test methods and procedures.

(a) Each owner or operator subject to the provisions of this subpart shall

comply with the requirements in § 61.245 of 40 CFR Part 61, Subpart V.

(b) To determine whether or not a piece of equipment is in benzene service, the methods in § 61.245(d) shall be used, except that, for exhausters, the percent benzene shall be 1 percent by weight, rather than the 10 percent by weight described in § 61.245(d).

§ 61.138 Recordkeeping and reporting requirements.

(a) The following information pertaining to the design of control equipment installed to comply with §§ 61.132 through 61.134 shall be recorded and kept in a readily accessible location:

(1) Detailed schematics, design specifications, and piping and instrumentation diagrams.

(2) The dates and descriptions of any changes in the design specifications.

(b) The following information pertaining to sources subject to § 61.132 and sources subject to § 61.133 shall be recorded and maintained for 2 years following each semiannual (and other) inspection and each annual maintenance inspection:

(1) The date of the inspection and the name of the inspector.

(2) A brief description of each visible defect in the source or control equipment and the method and date of repair of the defect.

(3) The presence of a leak, as measured using the method described in § 61.245(c). The record shall include the date of attempted and actual repair and method of repair of the leak.

(4) A brief description of any system abnormalities found during the annual maintenance inspection, the repairs made, the date of attempted repair, and the date of actual repair.

(c) Each owner or operator of a source subject to § 61.135 shall comply with § 61.246.

(d) For foundry coke by-product recovery plants, the annual coke production of both furnace and foundry coke shall be recorded and maintained for 2 years following each determination.

(e)(1) An owner or operator of any source to which this subpart applies shall submit a statement in writing notifying the Administrator that the requirements of this subpart and 40 CFR 61, Subpart V, have been implemented.

(2) In the case of an existing source or a new source that has an initial startup date preceding the effective date, the statement is to be submitted within 90 days of the effective date, unless a waiver of compliance is granted under § 61.11, along with the information required under § 61.10. If a waiver of

compliance is granted, the statement is to be submitted on a date scheduled by the Administrator.

(3) In the case of a new source that did not have an initial startup date preceding the effective date, the statement shall be submitted with the application for approval of construction, as described under § 61.07.

(4) The statement is to contain the following information for each source:

(i) Type of source (e.g., a light-oil sump or pump).

(ii) For equipment in benzene service, equipment identification number and process unit identification: percent by weight benzene in the fluid at the equipment; and process fluid state in the equipment (gas/vapor or liquid).

(iii) Method of compliance with the standard (e.g., "gas blanketing," "monthly leak detection and repair," or "equipped with dual mechanical seals"). This includes whether the plant plans to be a furnace or foundry coke by-product recovery plant for the purposes of § 61.132(d).

(f) A report shall be submitted to the Administrator semiannually starting 6 months after the initial reports required in § 61.138(e) and § 61.10, which includes the following information:

(1) For sources subject to § 61.132 and sources subject to § 61.133,

(i) A brief description of any visible defect in the source or ductwork.

(ii) The number of leaks detected and repaired, and

(iii) A brief description of any system abnormalities found during each annual maintenance inspection that occurred in the reporting period and the repairs made.

(2) For equipment in benzene service subject to § 61.135(a), information required by § 61.247(b).

(3) For each exhauster subject to § 61.135 for each quarter during the semiannual reporting period,

(i) The number of exhausters for which leaks were detected as described in § 61.135 (d) and (e)(5).

(ii) The number of exhausters for which leaks were repaired as required in § 61.135 (d) and (e)(6).

(iii) The results of performance tests to determine compliance with § 61.135(g) conducted within the semiannual reporting period.

(4) A statement signed by the owner or operator stating whether all provisions of 40 CFR part 61, subpart L, have been fulfilled during the semiannual reporting period.

(5) For foundry coke by-product recovery plants, the annual coke production of both furnace and foundry coke, if determined during the reporting period.

(6) Revisions to items reported according to paragraph (e) of this section if changes have occurred since the initial report or subsequent revisions to the initial report.

Note: Compliance with the requirements of § 61.10(c) is not required for revisions documented under this paragraph.

(g) In the first report submitted as required in § 61.138(e), the report shall include a reporting schedule stating the months that semiannual reports shall be submitted. Subsequent reports shall be submitted according to that schedule unless a revised schedule has been submitted in a previous semiannual report.

(h) An owner or operator electing to comply with the provisions of §§ 61.243-1 and 61.243-2 shall notify the Administrator of the alternative standard selected 90 days before implementing either of the provisions.

(i) An application for approval of construction or modification, as required under §§ 61.05(a) and 61.07, will not be required for sources subject to 61.135 if:

(1) The new source complies with § 61.135, and

(2) In the next semiannual report required by § 61.138(f), the information described in § 61.138(e)(4) is reported.

(Approved by the Office of Management and Budget under control number _____)

§ 61.139 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under Section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities that will not be delegated to States: § 61.136(d).

4. Section 61.241 of Subpart V is amended by revising the definition of "repaired" and by adding a definition of "stuffing box pressure" as follows:

§ 61.241 Definitions.

"Repaired" means that equipment is adjusted, or otherwise altered, to eliminate a leak.

"Stuffing box pressure" means the fluid (liquid or gas) pressure inside the casing or housing of a piece of equipment, on the process side of the inboard seal.

5. Section 61.245 of Subpart V is amended by revising introductory paragraph (b) and introductory paragraph (c) as follows:

§ 61.245 Test methods and procedures.

(b) Monitoring, as required in §§ 61.242, 61.243, 61.244, and 61.135, shall comply with the following requirements:

(c) When equipment is tested for compliance with or monitored for no detectable emissions, the owner or operator shall comply with the following requirements:

6. Section 61.246 of Subpart V is amended by revising the introductory texts of paragraphs (b), (c), and (e) and by revising paragraphs (e)(2), (e)(4)(i), and (h)(1) to read as follows:

§ 61.246 Recordkeeping requirements.

(b) When each leak is detected as specified in §§ 61.242-2, 61.242-3, 61.242-7, 61.242-8, and 61.135, the following requirements apply:

(c) When each leak is detected as specified in 61.242-2, 61.242-3, 61.242-7, 61.242-8, and 61.135, the following information shall be recorded in a log and shall be kept for 2 years in a readily accessible location:

(e) The following information pertaining to all equipment to which a standard applies shall be recorded in a log that is kept in a readily accessible location:

(2)(i) A list of identification numbers for equipment that the owner or operator elects to designate for no detectable emissions as indicated by an instrument reading of less than 500 ppm above background.

(ii) The designation of this equipment for no detectable emissions shall be signed by the owner or operator.

(4)(i) The dates of each compliance test required in §§ 61.242-2(e), 61.242-3(i), 61.242-4, 61.242-7(f), and 61.135(g).

(h)

(1) Design criterion required in §§ 61.242-2(d)(5), 61.242-3(e)(2), and 61.135(e)(4) and an explanation of the design criterion; and

7. Section 61.247 of Subpart V is amended by revising paragraph (b)(5) to read as follows:

§ 61.247 Reporting requirements.

(b)

(5) The results of all performance tests and monitoring to determine compliance

with no detectable emissions and with § 61.243-1 and 61.243-2 conducted within the semiannual reporting period.

8. Subpart Y is added as follows:

Subpart Y—National Emission Standard for Benzene Emissions from Benzene Storage Vessels

Sec.

61.270 Applicability and designation of sources.

61.271 Emission standard.

61.272 Compliance provisions.

61.273 Alternative means of emission limitation.

61.274 Initial report.

61.275 Periodic report.

61.276 Recordkeeping.

61.277 Delegation of authority.

Subpart Y—National Emission Standard for Benzene Emissions from Benzene Storage Vessels**§ 61.270 Applicability and designation of sources.**

(a) The source to which this subpart applies is each storage vessel that is storing benzene having a specific gravity within the range of specific gravities specified in ASTM D 836-84 for Industrial Grade Benzene, ASTM D 835-85 for Refined Benzene-485, ASTM D 2359-85a for Refined Benzene-535, and ASTM D 4734-87 for Refined Benzene-545. These specifications are incorporated by reference as specified in § 61.18.

(b) Except for paragraph (b) in § 61.276, storage vessels with a design storage capacity less than 38 cubic meters (10,000 gallons) are exempt from the provisions of this subpart.

(c) This subpart does not apply to storage vessels used for storing benzene at coke by-product facilities.

(d) This subpart does not apply to vessels permanently attached to motor vehicles such as trucks, rail cars, barges, or ships.

(e) This subpart does not apply to pressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere.

(f) A designated source subject to the provisions of this subpart that is also subject to applicable provisions of 40 CFR part 60 subparts K, Ka, and Kb shall be required to comply only with the subpart that contains the most stringent requirements for that source.

§ 61.271 Emission standard.

The owner or operator of each storage vessel with a design storage capacity greater than or equal to 38 cubic meters (10,000 gallons) to which this subpart applies shall comply with the requirements in paragraph (d) of this section and with the requirements either

in paragraph (a), (b), or (c) of this section, or equivalent as provided in § 61.273.

(a) The storage vessel shall be equipped with a fixed roof and an internal floating roof.

(1) An internal floating roof means a cover that rests on the liquid surface (but not necessarily in complete contact with it) inside a storage vessel that has a permanently affixed roof. The internal floating roof shall be floating on the liquid surface at all times, except during initial fill and during those intervals when the storage vessel is completely emptied or subsequently emptied and refilled. When the roof is resting on the leg supports, the process of filling, emptying, or refilling shall be continuous and shall be accomplished as rapidly as possible.

(2) Each internal floating roof shall be equipped with one of the closure devices listed in paragraphs (a)(2) (i), (ii), or (iii) of this section between the wall of the storage vessel and the edge of the internal floating roof. This requirement does not apply to each existing storage vessel for which construction of an internal floating roof equipped with a continuous seal commenced on or before July 28, 1988. A continuous seal means a seal that forms a continuous closure that completely covers the space between the wall of the storage vessel and the edge of the internal floating roof.

(i) A foam- or liquid-filled seal mounted in contact with the liquid (liquid-mounted seal). A liquid-mounted seal means a foam- or liquid-filled seal mounted in contact with the liquid between the wall of the storage vessel and the floating roof continuously around the circumference of the vessel.

(ii) Two seals mounted one above the other so that each forms a continuous closure that completely covers the space between the wall of the storage vessel and the edge of the internal floating roof. The lower seal may be vapor-mounted, but both must be continuous.

(iii) A metallic shoe seal. A metallic shoe seal (also referred to as a mechanical shoe seal) is, but is not limited to, a metal sheet held vertically against the wall of the storage vessel by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annular space between the metal sheet and the floating roof.

(3) Automatic bleeder vents are to be closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the roof leg supports.

(4) Each opening in a noncontact internal floating roof except for automatic bleeder vents (vacuum breaker vents) and the rim space vents is to provide a projection below the liquid surface.

(5) Each internal floating roof shall meet the specifications listed below. If an existing storage vessel had an internal floating roof with a continuous seal as of July 28, 1988, the requirements listed below do not have to be met until the first time after September 14, 1989, the vessel is emptied and degassed or September 14, 1999, whichever occurs first.

(i) Each opening in the internal floating roof except for leg sleeves, automatic bleeder vents, rim space vents, column wells, ladder wells, sample wells, and stub drains is to be equipped with a cover or lid. The cover or lid shall be equipped with a gasket. Covers on each access hatch and automatic gauge float well shall be bolted.

(ii) Each penetration of the internal floating roof for the purposes of sampling shall be a sample well. Each sample well shall have a slit fabric cover that covers at least 90 percent of the opening.

(iii) Each automatic bleeder vent shall be gasketed.

(iv) Rim space vents shall be equipped with a gasket.

(v) Each penetration of the internal floating roof that allows for passage of a ladder shall have a gasketed sliding cover.

(vi) Each penetration of the internal floating roof that allows for passage of a column supporting the fixed roof shall have a flexible fabric sleeve seal or a gasketed sliding cover.

(6) Each cover or lid on any opening in the internal floating roof shall be closed (i.e., no visible gaps), except when a device is in actual use. Covers on each access hatch and each automatic gauge float well which are equipped with bolts shall be bolted when they are not in use. Rim space vents are to be set to open only when the internal floating roof is not floating or at the manufacturer's recommended setting.

(b) The storage vessel shall have an external floating roof.

(1) An external floating roof means a pontoon-type or double-deck-type cover that rests on the liquid surface in a vessel with no fixed roof.

(2) Each external floating roof shall be equipped with a closure device between the wall of the storage vessel and the roof edge. Except as provided in paragraph (b)(5) of this section, the closure device is to consist of two seals, one above the other. The lower seal is

referred to as the primary seal and the upper seal is referred to as the secondary seal.

(i) The primary seal shall be either a metallic shoe seal or a liquid-mounted seal. A liquid-mounted seal means a foam- or liquid-filled seal mounted in contact with the liquid between the wall of the storage vessel and the floating roof continuously around the circumference of the vessel. A metallic shoe seal (which can also be referred to as a mechanical shoe seal) is, but is not limited to, a metal sheet held vertically against the wall of the storage vessel by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annular space between the metal sheet and the floating roof. Except as provided in § 61.272(b)(4), the primary seal shall completely cover the annular space between the edge of the floating roof and the vessel wall.

(ii) The secondary seal shall completely cover the annular space between the external floating roof and the wall of the storage vessel in a continuous fashion except as allowed in § 61.272(b)(4).

(3) Except for automatic bleeder vents and rim space vents, each opening in the noncontact external floating roof shall provide a projection below the liquid surface. Except for automatic bleeder vents, rim space vents, roof drains, and leg sleeves, each opening in the roof is to be equipped with a gasketed cover, seal or lid which is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use. Automatic bleeder vents are to be closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the roof leg supports. Rim vents are to be set to open when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting. Automatic bleeder vents and rim space vents are to be gasketed. Each emergency roof drain is to be provided with a slotted membrane fabric cover that covers at least 90 percent of the area of the opening.

(4) The roof shall be floating on the liquid at all times (i.e., off the roof leg supports) except during initial fill until the roof is lifted off leg supports and when the vessel is completely emptied and subsequently refilled. The process of emptying and refilling when the roof is resting on the leg supports shall be continuous and shall be accomplished as rapidly as possible.

(5) The requirement for a secondary seal does not apply to each existing storage vessel that was equipped with a liquid-mounted primary seal as of July

28, 1988, until after the first time after September 14, 1989, when the vessel is emptied and degassed or 10 years from September 14, 1989, whichever occurs first.

(c) The storage vessel shall be equipped with a closed vent system and a control device.

(1) The closed vent system shall be designed to collect all benzene vapors and gases discharged from the storage vessel and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background and visual inspections, as determined in § 61.242-11 (Subpart V).

(2) The control device shall be designed and operated to reduce inlet benzene emissions by 95 percent or greater. If a flare is used as the control device, it shall meet the specifications described in the general control device requirements of 40 CFR 60.18.

(3) The specifications and requirements listed in paragraphs (c)(1) and (c)(2) of this section for closed vent systems and control devices do not apply during periods of routine maintenance. During periods of routine maintenance, the benzene level in the storage vessel(s) serviced by the control device subject to the provisions of § 61.271(c) may be lowered but not raised. Periods of routine maintenance shall not exceed 72 hours as outlined in the maintenance plan required by § 61.272(c)(1)(iii).

(4) The specifications and requirements listed in paragraphs (c)(1) and (c)(2) of this section for closed vents and control devices do not apply during a control system malfunction. A control system malfunction means any sudden and unavoidable failure of air pollution control equipment. A failure caused entirely or in part by design deficiencies, poor maintenance, careless operation, or other preventable upset condition or equipment breakdown is not considered a malfunction.

(d) The owner or operator of each affected storage vessel shall meet the requirements of paragraph (a), (b), or (c) of this section as follows:

(1) The owner or operator of each existing benzene storage vessel shall meet the requirements of paragraph (a), (b), or (c) of this section no later than 90 days after December 13, 1989, with the exceptions noted in paragraphs (a)(5) and (b)(5), unless a waiver of compliance has been approved by the Administrator in accordance with § 61.11.

(2) The owner or operator of each benzene storage vessel upon which construction commenced after September 14, 1989, shall meet the

requirements of paragraph (a), (b), or (c) of this section prior to filling (i.e., roof is lifted off leg supports) the storage vessel with benzene.

(3) The owner or operator of each benzene storage vessel upon which construction commenced on or after July 28, 1986, and before September 14, 1989, shall meet the requirements of paragraph (a), (b), or (c) of this section on September 14, 1989.

§ 61.272 Compliance provisions.

(a) For each vessel complying with § 61.271(a) (fixed roof and internal floating roof) each owner or operator shall:

(1) After installing the control equipment required to comply with § 61.271(a), visually inspect the internal floating roof, the primary seal, and the secondary seal (if one is in service), prior to filling the storage vessel with benzene. If there are holes, tears or other openings in the primary seal, the secondary seal, or the seal fabric, or defects in the internal floating roof, the owner or operator shall repair the items before filling the storage vessel.

(2) Visually inspect the internal floating roof and the primary seal or the secondary seal (if one is in service) through manholes and roof hatches on the fixed roof at least once every 12 months after initial fill, or at least once every 12 months after September 14, 1989, except as provided in paragraph (a)(4)(i) of this section. If the internal floating roof is not resting on the surface of the benzene liquid inside the storage vessel, or there is liquid on the roof, or the seal is detached, or there are holes or tears in the seal fabric, the owner or operator shall repair the items or empty and remove the storage vessel from service within 45 days. If a failure that is detected during inspections required in this paragraph cannot be repaired within 45 days and if the vessel cannot be emptied within 45 days, an extension of up to 30 additional days may be requested from the Administrator in the inspection report required in § 61.275(a). Such a request for an extension must document that alternate storage capacity is unavailable and specify a schedule of actions the company will take that will ensure that the control equipment will be repaired or the vessel will be emptied as soon as possible.

(3) Visually inspect the internal floating roof, the primary seal, the secondary seal (if one is in service), gaskets, slotted membranes and sleeve seals (if any) each time the storage vessel is emptied and degassed. In no event shall inspections conducted in accordance with this provision occur at intervals greater than 10 years in the

case of vessels conducting the annual visual inspections as specified in paragraph (a)(2) of this section and at intervals greater than 5 years in the case of vessels specified in paragraph (a)(4)(i) of this section.

(i) For all the inspections required by paragraphs (a)(1) and (a)(3) of this section, the owner or operator shall notify the Administrator in writing at least 30 days prior to the refilling of each storage vessel to afford the Administrator the opportunity to have an observer present. If the inspection required by paragraph (a)(3) of this section is not planned and the owner or operator could not have known about the inspection 30 days in advance of refilling the vessel, the owner or operator shall notify the Administrator at least 7 days prior to the refilling of the storage vessel. Notification shall be made by telephone immediately followed by written documentation demonstrating why the inspection was unplanned. Alternatively, the notification including the written documentation may be made in writing and sent by express mail so that it is received by the Administrator at least 7 days prior to refilling.

(ii) If the internal floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric, or the gaskets no longer close off the liquid surfaces from the atmosphere, or the slotted membrane has more than 10 percent open area, the owner or operator shall repair the items as necessary so that none of the conditions specified in this paragraph exist before refilling the storage vessel with benzene.

(4) For vessels equipped with a double-seal system as specified in § 61.271(a)(2)(ii):

(i) Visually inspect the vessel as specified in paragraph (a)(3) of this section at least every 5 years; or

(ii) Visually inspect the vessel annually as specified in paragraph (a)(2) of this section, and at least every 10 years as specified in paragraph (a)(3) of this section.

(b) For each vessel complying with § 61.271(b) (external floating roof) the owner or operator shall:

(1) Determine the gap areas and maximum gap widths between the primary seal and the wall of the storage vessel, and the secondary seal and the wall of the storage vessel according to the following frequency.

(i) For an external floating roof vessel equipped with primary and secondary seals, measurements of gaps between the vessel wall and the primary seal

(seal gaps) shall be performed during the hydrostatic testing of the vessel or within 90 days of the initial fill with benzene or within 90 days of September 14, 1989, whichever occurs last, and at least once every 5 years thereafter, except as provided in paragraph (b)(1)(ii) of this section.

(ii) For an external floating roof vessel equipped with a liquid-mounted primary seal and without a secondary seal as provided for in § 61.271(b)(5), measurement of gaps between the vessel wall and the primary seal (seal gaps) shall be performed within 90 days of September 14, 1989, and at least once per year thereafter. When a secondary seal is installed over the primary seal, measurement of primary seal gaps shall be performed within 90 days of installation and at least once every 5 years thereafter.

(iii) For an external floating roof vessel equipped with primary and secondary seals, measurements of gaps between the vessel wall and the secondary seal shall be performed within 90 days of the initial fill with benzene, within 90 days of installation of the secondary seal, or within 90 days after September 14, 1989, whichever occurs last, and at least once per year thereafter.

(iv) If any source ceases to store benzene for a period of 1 year or more, subsequent introduction of benzene into the vessel shall be considered an initial fill for the purposes of paragraphs (b)(1)(i), (b)(1)(ii), and (b)(1)(iii) of this section.

(2) Determine gap widths and areas in the primary and secondary seals individually by the following procedures:

(i) Measure seal gaps, if any, at one or more floating roof levels when the roof is floating off the roof leg supports.

(ii) Measure seal gaps around the entire circumference of the vessel in each place where a 0.32 centimeter (cm) (1/8 in) diameter uniform probe passes freely (without forcing or binding against the seal) between the seal and the wall of the storage vessel and measure the circumferential distance of each such location.

(iii) The total surface area of each gap described in paragraph (b)(2)(ii) of this section shall be determined by using probes of various widths to measure accurately the actual distance from the vessel wall to the seal and multiplying each such width by its respective circumferential distance.

(3) Add the gap surface area of each gap location for the primary seal and the secondary seal individually. Divide the sum for each seal by the nominal

diameter of the vessel and compare each ratio to the respective standards in § 61.272(b)(4) and § 61.272(b)(5).

(4) Repair conditions that do not meet requirements listed in paragraph (b)(4)(i) and (ii) within 45 days of identification in any inspection or empty and remove the storage vessel from service within 45 days.

(i) The accumulated area of gaps between the vessel wall and the metallic shoe seal or the liquid-mounted primary seal shall not exceed 212 cm² per meter of vessel diameter (10.0 in² per foot of vessel diameter) and the width of any portion of any gap shall not exceed 3.81 cm (1½ in).

(A) One end of the metallic shoe is to extend into the stored liquid and the other end is to extend a minimum vertical distance of 61 cm (24 in) above the stored liquid surface.

(B) There are to be no holes, tears, or other openings in the shoe, seal fabric, or seal envelope.

(ii) The secondary seal is to meet the following requirements:

(A) The secondary seal is to be installed above the primary seal so that it completely covers the space between the roof edge and the vessel wall except as provided in paragraph (b)(4)(ii)(B) of this section.

(B) The accumulated area of gaps between the vessel wall and the secondary seal shall not exceed 21.2 cm² per meter of vessel diameter (1.0 in² per foot of vessel diameter) or the width of any portion of any gap shall not exceed 1.27 cm (½ in). These seal gap requirements may be exceeded during the measurement of primary seal gaps as required by paragraph (b)(1)(i) or (b)(1)(ii) of this section.

(C) There are to be no holes, tears, or other openings in the seal or seal fabric.

(iii) If a failure that is detected during inspections required in this paragraph cannot be repaired within 45 days and if the vessel cannot be emptied within 45 days, an extension of up to 30 additional days may be requested from the Administrator in the inspection report required in § 61.275(d). Such extension request must include a demonstration of unavailability of alternate storage capacity and a specification of a schedule that will assure that the control equipment will be repaired or the vessel will be emptied as soon as possible.

(5) The owner or operator shall notify the Administrator 30 days in advance of any gap measurements required by paragraph (b)(1) of this section to afford the Administrator the opportunity to have an observer present.

(6) Visually inspect the external floating roof, the primary seal,

secondary seal, and fittings each time the vessel is emptied and degassed.

(i) If the external floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric, the owner or operator shall repair the items as necessary so that none of the conditions specified in this paragraph exist before filling or refilling the storage vessel with benzene.

(ii) For all the inspections required by paragraph (b)(6) of this section, the owner or operator shall notify the Administrator in writing at least 30 days prior to filling or refilling of each storage vessel to afford the Administrator the opportunity to inspect the storage vessel prior to refilling. If the inspection required by paragraph (b)(6) of this section is not planned and the owner or operator could not have known about the inspection 30 days in advance of refilling the vessel, the owner or operator shall notify the Administrator at least 7 days prior to refilling of the storage vessel. Notification shall be made by telephone immediately followed by written documentation demonstrating why the inspection was unplanned. Alternatively, this notification including the written documentation may be made in writing and sent by express mail so that it is received by the Administrator at least 7 days prior to the refilling.

(c) The owner or operator of each source that is equipped with a closed vent system and control device as required in § 60.271(c), other than a flare, shall meet the following requirements.

(1) Within 90 days after initial fill or after September 14, 1989, whichever comes last, submit for approval by the Administrator, an operating plan containing the information listed below.

(i) Documentation demonstrating that the control device being used achieves the required control efficiency during reasonably expected maximum loading conditions. This documentation is to include a description of the gas stream which enters the control device, including flow and benzene content under varying liquid level conditions (dynamic and static) and manufacturer's design specifications for the control device. If the control device or the closed vent capture system receives vapors, gases or liquids, other than fuels, from sources that are not designated sources under this subpart, the efficiency demonstration is to include consideration of all vapors, gases and liquids received by the closed vent capture system and control device.

If an enclosed combustion device with a minimum residence time of 0.75 seconds and a minimum temperature of 816 °C is used to meet the 95 percent requirement, documentation that those conditions exist is sufficient to meet the requirements of this paragraph.

(ii) A description of the parameter or parameters to be monitored to ensure that the control device is operated and maintained in conformance with its design and an explanation of the criteria used for selection of that parameter (or parameters).

(iii) A maintenance plan for the system including the type of maintenance necessary, planned frequency of maintenance, and lengths of maintenance periods for those operations that would require the closed vent system or the control device to be out of compliance with § 61.271(c). The maintenance plan shall require that the system be out of compliance with § 61.271(c) for no more than 72 hours per year.

(2) Operate, monitor the parameters, and maintain the closed vent system and control device in accordance with the operating plan submitted to the Administrator in accordance with paragraph (c)(1) of this section, unless the plan was modified by the Administrator during the approval process. In this case, the modified plan applies.

(d) The owner or operator of each source that is equipped with a closed vent system and a flare to meet the requirements in § 61.271(c) shall meet the requirements as specified in the general control device requirements in 40 CFR 60.18 (e) and (f).

§ 61.273 Alternative means of emission limitation.

(a) Upon written application from any person, the Administrator may approve the use of alternative means of emission limitation which have been demonstrated to his satisfaction to achieve a reduction in benzene emissions at least equivalent to the reduction in emissions achieved by any requirement in § 61.271 (a), (b), or (c) of this subpart.

(b) Determination of equivalence to the reduction in emissions achieved by the requirements of § 61.271 (a), (b), or (c) will be evaluated using the following information to be included in the written application to the Administrator:

(1) Actual emissions tests that use full-size or scale-model storage vessels that accurately collect and measure all benzene emissions from a given control device, and that accurately simulate wind and account for other emission

variables such as temperature and barometric pressure.

(2) An engineering evaluation that the Administrator determines is an accurate method of determining equivalence.

(c) The Administrator may condition approval of equivalency on requirements that may be necessary to ensure operation and maintenance to achieve the same emission reduction as the requirements of § 61.271 (a), (b), or (c).

(d) If, in the Administrator's judgment, an application for equivalence may be approvable, the Administrator will publish a notice of preliminary determination in the **Federal Register** and provide the opportunity for public hearing. After notice and opportunity for public hearing, the Administrator will determine the equivalence of the alternative means of emission limitation and will publish the final determination in the **Federal Register**.

§ 61.274 Initial report.

(a) The owner or operator of each storage vessel to which this subpart applies and which has a design capacity greater than or equal to 38 cubic meters (10,000 gallons) shall submit an initial report describing the controls which will be applied to meet the equipment requirements in § 61.271. For an existing storage vessel or a new storage vessel for which construction and operation commenced prior to September 14, 1989, this report shall be submitted within 90 days of September 14, 1989, and can be combined with the report required by § 61.10. For a new storage vessel for which construction or operation commenced on or after September 14, 1989, the report shall be combined with the report required by § 61.07. In the case where the owner or operator seeks to comply with § 61.271(c) with a control device other than a flare, this information may consist of the information required by 61.272(c)(1).

(b) The owner or operator of each storage vessel seeking to comply with § 61.271(c) with a flare, shall submit a report containing the measurements required by 40 CFR 60.18(f) (1), (2), (3), (4), (5), and (6). For the owner or operator of an existing storage vessel not seeking to obtain a waiver or a new storage vessel for which construction and operation commenced prior to September 14, 1989, this report shall be combined with the report required by paragraph (a) of this section. For the owner or operator of an existing storage vessel seeking to obtain a waiver, the reporting date will be established in the response to the waiver request. For the owner or operator of a new storage vessel for which construction or

operation commenced after September 14, 1989, the report shall be submitted within 90 days of the date the vessel is initially filled (or partially filled) with benzene.

(Approved by the Office of Management and Budget under control number 2060-0185).

§ 61.275 Periodic report.

(a) The owner or operator of each storage vessel to which this subpart applies after installing control equipment in accordance with § 61.271(a) (fixed roof and internal floating roof) shall submit a report describing the results of each inspection conducted in accordance with § 61.272(a). For vessels for which annual inspections are required under § 61.272(a)(2), the first report is to be submitted no more than 12 months after the initial report submitted in accordance with § 61.274, and each report is to be submitted within 60 days of each annual inspection.

(1) Each report shall include the date of the inspection of each storage vessel and identify each storage vessel in which:

(i) The internal floating roof is not resting on the surface of the benzene liquid inside the storage vessel, or there is liquid on the roof, or the seal is detached from the internal floating roof, or there are holes, tears or other openings in the seal or seal fabric; or

(ii) There are visible gaps between the seal and the wall of the storage vessel.

(2) Where an annual report identifies any condition in paragraph (a)(1) of this section the annual report shall describe the nature of the defect, the date the storage vessel was emptied, and the nature of and date the repair was made, except as provided in paragraph (a)(3) of this section.

(3) If an extension is requested in an annual periodic report in accordance with § 61.272(a)(2), a supplemental periodic report shall be submitted within 15 days of repair. The supplemental periodic report shall identify the vessel and describe the date the storage vessel was emptied and the nature of and date the repair was made.

(b) The owner or operator of each storage vessel to which this subpart applies after installing control equipment in accordance with § 61.271(a) (fixed roof and internal floating roof) shall submit a report describing the results of each inspection conducted in accordance with § 61.272(a) (3) or (4).

(1) The report is to be submitted within 60 days of conducting each inspection required by § 61.272(a) (3) or (4).

(2) Each report shall identify each storage vessel in which the owner or operator finds that the internal floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal (if one has been installed) has holes, tears, or other openings in the seal or the seal fabric, or the gaskets no longer close off the liquid surfaces from the atmosphere, or the slotted membrane has more than 10 percent open area. The report shall also describe the nature of the defect, the date the storage vessel was emptied, and the nature of and date the repair was made.

(c) Any owner or operator of an existing storage vessel which had an internal floating roof with a continuous seal as of July 28, 1988, and which seeks to comply with the requirements of § 61.271(a)(5) during the first time after September 14, 1989, when the vessel is emptied and degassed but no later than 10 years from September 14, 1989, shall notify the Administrator 30 days prior to the completion of the installation of such controls and the date of refilling of the vessel so the Administrator has an opportunity to have an observer present to inspect the storage vessel before it is refilled. This report can be combined with the one required by § 61.275(b).

(d) The owner or operator of each storage vessel to which this subpart applies after installing control equipment in accordance with § 61.271(b) (external floating roof) shall submit a report describing the results of each seal gap measurement made in accordance with § 61.272(b). The first report is to be submitted no more than 12 months after the initial report submitted in accordance with § 61.274(a), and each annual periodic report is to be submitted within 60 days of each annual inspection.

(1) Each report shall include the date of the measurement, the raw data obtained in the measurement, and the calculations described in § 61.272(b) (2) and (3), and shall identify each storage vessel which does not meet the gap specifications of § 61.272(b). Where an annual report identifies any vessel not meeting the seal gap specifications of § 61.272(b) the report shall describe the date the storage vessel was emptied, the measures used to correct the condition and the date the storage vessel was brought into compliance.

(2) If an extension is requested in an annual periodic report in accordance with § 61.272(b)(4)(iii), a supplemental periodic report shall be submitted within 15 days of repair. The supplemental periodic report shall identify the vessel and describe the date the vessel was

emptied and the nature of and date the repair was made.

(e) Excess emission report.

(1) The owner or operator of each source seeking to comply with § 61.271(c) (vessels equipped with closed vent systems with control devices) shall submit a quarterly report informing the Administrator of each occurrence that results in excess emissions. Excess emissions are emissions that occur at any time when compliance with the specifications and requirements of § 61.271(c) are not achieved, as evidenced by the parameters being measured in accordance with § 61.272(c)(1)(ii) if a control device other than a flare is used, or by the measurements required in § 61.272(d) and the general control device requirements in 40 CFR 60.18(f)(1) and (2) if a flare is used.

(2) The owner or operator shall submit the following information as a minimum in the report required by (e)(1) of this section:

(i) Identify the stack and other emission points where the excess emissions occurred;

(ii) A statement of whether or not the owner or operator believes a control system malfunction has occurred.

(3) If the owner or operator states that a control system malfunction has occurred, the following information as a minimum is also to be included in the report required under paragraph (e)(1) of this section:

(i) Time and duration of the control system malfunction as determined by continuous monitoring data (if any), or

the inspections or monitoring done in accordance with the operating plan required by § 61.272(c).

(ii) Cause of excess emissions.

(Approved by the Office of Management and Budget under control number 2060-0185).

§ 61.276 Recordkeeping.

(a) Each owner or operator with a storage vessel subject to this subpart shall keep copies of all the reports and records required by this subpart for at least 2 years, except as specified in paragraphs (b) and (c)(1) of this section.

(b) Each owner or operator with a storage vessel, including any vessel which has a design storage capacity less than 38 cubic meters (10,000 gallons), shall keep readily accessible records showing the dimensions of the storage vessel and an analysis showing the capacity of the storage vessel. This record shall be kept as long as the storage vessel is in operation. Each storage vessel with a design capacity of less than 38 cubic meters (10,000 gallons) is subject to no provisions of this subpart other than those required by this paragraph.

(c) The following information pertaining to closed vent system and control devices shall be kept in a readily accessible location.

(1) A copy of the operating plan. This record shall be kept as long as the closed vent system and control device is in use.

(2) A record of the measured values of the parameters monitored in accordance with § 61.272(c)(1)(ii) and § 61.272(c)(2).

(3) A record of the maintenance performed in accordance with § 61.272(c)(1)(iii) of the operating plan, including the following:

(i) The duration of each time the closed vent system and control device does not meet the specifications of § 61.271(c) due to maintenance, including the following:

(A) The first time of day and date the requirements of 61.271(c) were not met at the beginning of maintenance.

(B) The first time of day and date the requirements of § 61.271(c) were met at the conclusion of maintenance.

(C) A continuous record of the liquid level in each storage vessel that the closed vent system and control device receive vapors from during the interval between the times specified by (c)(3)(i)(A) and (c)(3)(i)(B). Pumping records (simultaneous input and output) may be substituted for records of the liquid level.

(Approved by the Office of Management and Budget under control number 2060-0185).

§ 61.277 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: § 61.273.

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ENVIRONMENTAL PROTECTION AGENCY**40 CFR Part 61**

(AD-FRL-3620-5)

National Emission Standards for Hazardous Air Pollutants; Benzene Emissions From Chemical Manufacturing Process Vents, Industrial Solvent Use, Benzene Waste Operations, Benzene Transfer Operations, and Gasoline Marketing System**AGENCY:** Environmental Protection Agency (EPA).**ACTION:** Proposed rule and notice of public hearing.

SUMMARY: On February 7, 1989, as a result of a petition filed by the Natural Resources Defense Council, et al., the D.C. Circuit Court ordered EPA either to propose regulations establishing standards for emissions of benzene from several source categories or publish a notice of intention not to regulate by August 5, 1989. The court subsequently issued an amended order extending the deadline until August 31, 1989. This action proposes national emission standards for hazardous air pollutants (NESHAP) limiting emissions of benzene from the following source categories: Industrial solvent use, benzene waste operations, benzene transfer operations, and the gasoline marketing system. This action also proposes not to regulate the chemical manufacturing process vent source category. These actions are being proposed under Section 112 of the Clean Air Act.

A public hearing will be held, if requested, to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning these proposed actions.

DATES: *Comments.* Comments must be received by November 13, 1989.

Public Hearing. If anyone contacts EPA requesting to speak at a public hearing by October 4, 1989, a public hearing will be held on October 4, 1989 beginning at 9:00 a.m. Persons interested in attending the hearing should call Ms. Mary Hinson at (919) 541-5578 to verify that a hearing will be held.

Request to Speak at Hearing. Persons wishing to present oral testimony must notify EPA by October 4, 1989.

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Air Docket Section (LE-131), Attention (refer to the appropriate docket number), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460. The applicable

dockets are: Docket No. OAQPS 79-3 Part I, for health effects, listing and regulation of benzene; Docket No. A-89-03, Benzene Emissions from Process Vents at Chemical Plants; Docket No. A-89-04, Benzene Transfer Operations; Docket No. A-89-05, Benzene Solvent Use; Docket No. A-89-06, Benzene Waste Operations; and Docket No. A-89-07, Gasoline Marketing System (bulk terminals, bulk plants, and service station storage).

Public Hearing. If anyone contacts EPA requesting a public hearing, it will be held on October 11, 1989. Persons interested in attending the hearing or wishing to present oral testimony should notify Ms. Mary Hinson, Standards Development Branch (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5578.

Docket. The docket for each source category, containing supporting information used in developing the proposed standards or used as the basis for not regulating, is available for public inspection and copying between 8:30 a.m. and 3:30 p.m., Monday through Friday, at EPA's Air Docket Section, Waterside Mall, Room M1500, 1st Floor, 401 M Street SW., Washington, DC 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: For information on benzene emissions and regulations, contact either Mr. Doug Bell at (919) 541-5568, or Dr. Janet Meyer at (919) 541-5254, Standards Development Branch, Emission Standards Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. For information concerning the health effects of benzene and the risk assessment, contact Mr. Scott Voorhees at (919) 541-5348, Pollutant Assessment Branch, Emission Standards Division (MD-13), at the above address.

SUPPLEMENTARY INFORMATION: The information presented in this preamble is organized as follows:

- I. Background Documents and Notices
 - A. Background Documents
 - B. Previous Federal Register Notices
- II. Definitions
 - A. Terms
 - B. Acronyms
- III. Background
- IV. Characterization of Benzene Health Risks
- V. Policy for Developing NESHAP
- VI. Discussion of Source Categories
 - A. Benzene Emissions from Chemical Manufacturing Process Vents
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- VII. Administrative Requirements
 - A. Paperwork Reduction Act

- B. Regulatory Flexibility Act
- C. Public Hearing
- D. Docket
- E. Executive Order 12291
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I. Background Documents and Notices**A. Background Documents**

The following is a listing of background documents pertaining to the health effects of benzene and previous regulatory development efforts for each source category. The complete title, EPA publication number, publication date, and National Technical Information Service (NTIS) and docket numbers are included. Where appropriate, an abbreviated descriptive title used to refer to the document throughout this notice is also listed.

General Health and Policy Documents Regarding Benzene (Docket No. OAQPS 79-3, Part I)

- (1) "Assessment of Human Exposures to Atmospheric Benzene," EPA-450/3-78-031, May 1978. (NTIS Number PB-284203). (Docket Item II-A-28).
- (2) "Assessment of Health Effects of Benzene Germane to Low Level Exposures," EPA-600/1-78-61, September 1978. (NTIS Number PB-289789). (Docket Item II-A-30).
- (3) "Carcinogen Assessment Group's Final Report on Population Risk to Ambient Benzene Exposures," EPA-450/5-80-004, January 1979. (NTIS Number PB82-227372). (Docket Items II-A-31 and 31A).
- (4) "Response to Public Comments on EPA's Listing and Regulation of Benzene Under Section 112: Comments of a General Policy Nature," EPA-450/5-84-001, May 1984. (Docket Item VII-B-2).
- (5) "Response to Public Comments on EPA's Listing of Benzene Under Section 112," EPA-450/5-82-003, May 1984. (Docket Item VII-B-1).
- (6) "Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene." Internal Draft. EPA-600/X-85-022, February 1985. (Docket Item VIII-A-4).

Benzene Emissions From Chemical Manufacturing Process Vents (Docket No. A-89-03)

- (1) "Organic Chemical Manufacturing, Volume 7: Selected Processes," EPA-450/3-80-028b, December 1980. (NTIS Number PB81-220568) (Docket Items II-A-2 through II-A-6).

Benzene Transfer Operations (Docket No. A-89-04)

- (1) "Controlling Hydrocarbon Emissions from Tank Vessel Loading."

Marine Board Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D.C. 1987. (Docket Item II-1-2).

(2) "Draft Regulatory Impact Analysis: Proposed Refueling Emission Regulations for Gasoline-Fueled Motor Vehicles," EPA-450/3-87-001a, July 1987. (NTIS Number PB-221677/REB) (Docket Item II-A-2).

(3) "Compilation of Air Pollutant Emission Factors", AP-42, Supplement No. 2, September 1985. (Docket Item II-A-1).

Industrial Solvent Use (Docket No. A-89-05)

(1) "Rubber Tire Manufacturing Industry—Background Information for Proposed Standards," EPA-450/3-81-008a, July 1981. (NTIS Number PB83-163543). (Docket Item II-A-1). Referred to in solvent use section of this preamble as: Rubber Tire BID.

Benzene Waste Operations (Docket No. A-89-06)

(1) "Hazardous Waste TSDF—Background Information for Proposed RCRA Air Emission Standards, Volume II—Appendices," Draft, March 1988.

(2) "Control of Volatile Organic Emissions from Industrial Wastewater, Volume II—Appendices," Preliminary Draft, April 1989.

(3) "Hazardous Waste Treatment, Storage, and Disposal Facilities—Air Emission Models," EPA-450/3-87-026, December 1987.

Gasoline Marketing System (Docket No. A-89-07)

(1) "Bulk Gasoline Terminals—Background Information for Proposed Standards," EPA-450/3-80-038a, December 1980. (Docket Item II-A-1).

(2) "Bulk Gasoline Terminals—Background Information for Promulgated Standards," EPA-450/3-80-038b, August 1983. (Docket Item II-A-2).

(3) "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry," EPA-450/3-84-012a (Executive Summary, EPA-450/3-84-012b), July 1984. (Docket Item II-A-3).

(4) "Draft Regulatory Impact Analysis, Proposed Refueling Emission Regulations for Gasoline-Fueled Vehicles—Volume I—Analysis of Gasoline Regulatory Marketing Strategies," EPA-450/3-87-001a, July 1987. (Docket Item II-A-4). A copy of this document may be obtained from the EPA Library (MD-35), Research Triangle Park, N.C. 27711, telephone (919) 541-2777.

(5) "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry—Responses to Public Comments," EPA-450/3-84-012c, July 1987. (Docket Item II-A-5). A copy of this document may be obtained from the EPA Library (MD-35), Research Triangle Park, N.C. 27711, telephone (919) 541-2777.

The background documents listed above can be found in the dockets or purchased from NTIS, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, telephone number (703) 487-4650.

B. Previous Federal Register Notices

Previous **Federal Register** notices pertaining to standards development for the five source categories emitting benzene are listed below in chronological order. Since the complete **Federal Register** citations and dates are listed here, they will not be repeated throughout this notice.

(1) "National Emission Standards for Hazardous Air Pollutants; Addition of Benzene to List of Hazardous Air Pollutants," 42 FR 29332, June 8, 1977.

(2) "Standards of Performance for New Stationary Sources; Emissions Limitation of Volatile Organic Compounds From Gasoline Tank Truck Loading Racks at Bulk Gasoline Terminals (Proposed Rule)," 45 FR 83126, December 17, 1980.

(3) "Standards of Performance for New Stationary Sources: Bulk Gasoline Terminals (Final Rule)," 48 FR 37578, August 18, 1983.

(4) "National Emission Standards for Hazardous Air Pollutants; Regulation of Benzene; Response to Public Comments," 49 FR 23478, June 6, 1984.

(5) "Regulatory Strategies for the Gasoline Marketing Industry" (Notice of Document Availability for Public Comment), 49 FR 31706, August 18, 1984.

(6) "Standards of Performance for New Stationary Sources; Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels) Constructed after July 23, 1984" (Final Rule), 52 FR 11420, April 8, 1987.

(7) "Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines: Refueling Emission Regulations for Gasoline-Fueled Light-Duty Vehicles and Trucks and Heavy-Duty Vehicles" (Proposed Rule), 52 FR 31162, August 19, 1987.

(8) "Occupational Exposure to Benzene" (Final Rule), 52 FR 34460, September 11, 1987.

(9) "Standards of Performance for New Stationary Sources: Rubber Tire Manufacturing Industry" (Final Rule), 52 FR 34868, September 15, 1987.

(10) "National Emission Standards for Hazardous Air Pollutants; Benzene Emissions from Maleic Anhydride Plants, Ethylbenzene/Styrene Plants, Benzene Storage Vessels, Benzene Equipment Leaks, and Coke By-Product Recovery Plants" (Proposed Rule), 53 FR 28496, July 28, 1988.

(11) "National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides" (Proposed Rule), 54 FR 9612, March 7, 1989.

II. Definitions

A. Terms

The following terms are used in one or more discussions in the preamble. However, the particular proposed regulation should be consulted with regard to the exact definition of any term as it relates to a specific source category.

Azeotropic. Of or pertaining to a solution of two or more liquids, the composition of which does not change upon distillation.

Bulk plant. A facility which is used for the storage and distribution of a product by tank truck, and which receives the majority of its product by tank truck.

Bulk terminal. Any facility which is used for the storage and distribution of a product and which receives a product by ship or barge, or other transport vehicle.

Carbon adsorber. A product recovery or emissions control method whereby hydrocarbons and other compounds are selectively adsorbed on the surface of activated carbon.

Condenser. A product recovery or emissions control method in which one or more volatile components of a vapor mixture are separated from the remaining vapors through saturation followed by a pressure or temperature induced phase change.

Flare. An emissions control device that uses an open flame for combustion of gases to destroy organic compounds.

Gasoline. Any petroleum distillate or petroleum distillate/alcohol blend having a Reid vapor pressure of 27.6 kilopascals or greater which is used as a fuel for internal combustion engines.

Group A—Human Carcinogen. This group refers to agents for which there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer in humans.

Group B—Probable Human Carcinogen. This group includes agents for which the weight of evidence of human carcinogenicity based on epidemiologic studies is "limited" and also includes agents for which the weight of evidence of carcinogenicity

based on animal studies is "sufficient." The group is divided into two subgroups. Usually, Group B1 is reserved for agents for which there is limited evidence of carcinogenicity from epidemiologic studies. Agents for which there is "sufficient" evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies would usually be categorized under Group B2. It is reasonable, for practical purposes, to regard an agent for which there is "sufficient" evidence of carcinogenicity in animals as if it presented a carcinogenic risk to humans.

Incidence. The estimated average number of excess fatal cancers expected annually in the exposed population.

Incidence by Risk Group. For various levels of individual risk, the estimated annual incidence of fatal cancers within the population at that level of individual risk, incurred as a result of exposure to a given hazardous air pollutant.

Loading rack. The loading arms, pumps, meters, shutoff valves, relief valves, and other piping and valves necessary to fill delivery tank trucks.

Maximum Individual Lifetime Risk (MIR). The additional cancer risk to a person due to exposure for a 70-year lifetime at a point of maximum concentration of an emitted pollutant.

Reactant. A substance that acts upon, or is acted upon by other reactant substances in a chemical reaction to produce product substances.

Risk Distribution. For various levels of individual lifetime risk, the cumulative number of people estimated to be at that level of risk or greater due to exposure to ambient concentrations of a given hazardous air pollutant.

Service station. Any facility which dispenses gasoline for the purpose of refueling motor vehicles.

Solvent. A substance capable of dissolving another substance to form a uniformly dispersed mixture.

Splash loading. A method of filling a storage/transfer vessel or container where the fill pipe dispensing the liquid is lowered only partway into the vessel.

Submerged loading. A method of filling a storage/transfer vessel or container where the fill pipe either extends below the liquid surface or the fill pipe is permanently attached to the bottom of the vessel.

Tank truck. A delivery tank truck used at bulk terminals or bulk plants which is loading a product or which has loaded a product on the immediately previous load.

Thermal incinerator. Any enclosed combustion device that is used to destroy organic compounds and does

not extract energy in the form of steam or process heat.

Vapor balance. Direct displacement of air and hydrocarbon vapors from a vessel receiving volatile organic liquids to the vessel delivering the volatile organic liquid by means of a hose, pipe, or other equipment.

Vapor balance service. An emissions control method for vessels in which the vapors displaced during product loading/unloading are retrieved and transported back to the loading vessel.

Vapor collection system. Any equipment used for containing total organic compounds vapors displaced during the loading of vessels with volatile organic liquids.

Vapor processing system. All equipment used for recovering or oxidizing organic compounds vapors displaced from the affected facility.

Vapor recovery system. An emissions control method for vessels whereby vapors displaced during product loading/unloading are captured and routed through a single point for retrieval or destruction.

Vapor-tight tank truck. A tank truck which has demonstrated within the 12 preceding months that its product delivery tank will sustain a pressure change of not more than 750 pascals (75 mm of water) within 5 minutes after it is pressurized to 4,500 pascals (450 mm of water). This capability is to be demonstrated using the pressure test procedure specified in Method 27 of Appendix A to 40 CFR Part 60.

B. Acronyms

ARAR—applicable or relevant and appropriate requirement
 BID—background information document
 BDAT—best demonstrated available technology
 CAA—Clean Air Act
 CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act
 CMA—Chemical Manufacturers Association
 CRA—compression-refrigeration-absorption
 CRC—compression-refrigeration-condensation
 CTG—control techniques guidelines
 EB/S—ethylbenzene/styrene
 EPA—Environmental Protection Agency
 FWPCA—Federal Water Pollution Control Act
 HEM—Human Exposure Model
 ISC—Industrial Source Complex (dispersion model)
 ISDB—Industrial Studies Data Base
 LDR—land disposal restrictions
 LOA—lean oil absorption
 MIR—maximum individual lifetime risk

NESHAP—national emission standards for hazardous air pollutants
 NIOSH—National Institute for Occupational Safety and Health
 NSPS—new source performance standard
 NTIS—National Technical Information Service
 OMB—Office of Management and Budget
 OSHA—Occupational Safety and Health Administration
 OSW—Office of Solid Waste
 OW—Office of Water
 POTW—publicly owned treatment work
 PRDB—Petroleum Refineries Data Base
 RCRA—Resource Conservation and Recovery Act
 SARA—Superfund Amendment and Reauthorization Act
 SBA—Small Business Administration
 SIC—Standard Industrial Classification
 SIP—State Implementation Plan
 SRI—Stanford Research Institute
 SWMU—solid waste management unit
 TFE—thin-film evaporation
 TSCA—Toxic Substances Control Act
 TSDF—treatment, storage, and disposal facility
 TSDR—treatment, storage, disposal and recycling facility
 URE—unit risk estimate
 VOC—volatile organic compound

III. Background

Since the early 1900's, the scientific and medical communities have recognized benzene as a potentially toxic substance. Benzene was recognized as a potential human carcinogen (leukemia) in the early 1970's based on occupational studies of synthetic rubber, chemical, and shoe workers. Other documented occupational effects include impairment of the blood-forming system, immunotoxicity, chromosome breakage, and neurotoxicity. Results of animal studies support the leukemogenic potential of benzene and show also reproductive and developmental toxicity.

Benzene is common in our indoor and outdoor air. Major sources of benzene include automobile exhaust, automobile refueling operations, consumer products, cigarette smoking, and industrial emissions.

In 1977, the Administrator announced his decision to list benzene as a hazardous air pollutant under Section 112 of the CAA (42 FR 29332, June 8, 1977). Benzene was determined to be a hazardous air pollutant because of its carcinogenic properties. A hazardous air pollutant is defined in Section 112(a)(1) of the CAA as

* * * an air pollutant to which no ambient air quality standard is applicable and which * * * may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness.

Section 112(b)(1)(B) of the CAA requires EPA to establish emission standards for a hazardous air pollutant "at the level which in [the Administrator's] judgment provides an ample margin of safety to protect the public health from such hazardous air pollutant."

The listing of benzene as a hazardous air pollutant led to the publication of proposed standards for benzene emissions from maleic anhydride process vents, EB/S process vents, benzene storage vessels, and benzene equipment leaks in 1980 and 1981. After receipt of comments from industry and members of the public, EPA published a final rule setting an emission standard for benzene equipment leaks on June 6, 1984 (49 FR 23498). On that date, EPA also withdrew its proposed standards for maleic anhydride process vents, EB/S process vents, and benzene storage vessels (49 FR 23558). The withdrawal was based on the conclusion that both the benzene health risks to the public from these three source categories, and the potential reductions in health risks achievable with available control techniques were too small to warrant Federal regulatory action under section 112 of the CAA. Also on that date, EPA published a proposed standard for benzene emissions from coke by-product recovery plants (49 FR 23522).

On July 28, 1987, the United States Court of Appeals for the District of Columbia Circuit remanded to the EPA an emissions standard for vinyl chloride which had also been promulgated under section 112 of the CAA (the *Vinyl Chloride* decision). In this decision, the court concluded that EPA had improperly considered cost and technological feasibility without first making a determination of acceptable risk based exclusively on health considerations. In light of this decision, the EPA requested, and the court granted, a voluntary remand of the June 6, 1984, benzene equipment leaks NESHAP and the three withdrawals.

The EPA also decided to reconsider the 1984 proposal for coke by-product recovery plants. In reviewing these previous decisions for compliance with the *Vinyl Chloride* decision, EPA reevaluated the assumptions and methodology it has used in making section 112 regulatory determinations. The EPA decided that substantial input from the public and all interested organizations should be solicited in

formulating a strategy on how to execute the requirements of section 112 of the CAA in future rulemakings. Consequently, the EPA published in the **Federal Register** on July 28, 1988 (53 FR 28496) four proposed policy approaches for making section 112 regulatory decisions and published alternative proposed standards for benzene emissions from maleic anhydride plants, EB/S plants, benzene storage vessels, benzene equipment leaks, and coke by-product recovery plants. The EPA policy for developing NESHAP resulted from consideration of public comments on those four proposed policy approaches.

On February 7, 1989, the United States District Court for the District of Columbia responded to a petition filed in 1984 by the Natural Resources Defense Council, et al. This petition sought to compel the EPA Administrator, within the 180-day time frame embodied in section 112 of the CAA, to propose emission standards for a variety of benzene source categories, none of which had been included in the Court of Appeals remand.

The court subsequently ordered EPA to publish in the **Federal Register** on or before August 5, 1989, either a notice of intent not to regulate, or a notice of proposed regulations establishing NESHAP limiting emissions of benzene from the following sources: chemical manufacturing process units, including ethylene plants, chlorobenzene plants, nitrobenzene plants, linear alkylbenzene plants, cyclohexane plants; waste disposal from chemical manufacturing plants and refineries; industrial solvent usage; and bulk terminals, bulk plants, and gasoline service stations (including the filling of gasoline service station tanks by gasoline tank trucks, but not including the refueling of motor vehicles at gasoline service stations). The notice was also to include an opportunity for public hearings on these proposed regulations to be held within 30 days of publishing the **Federal Register** notice. The court amended its order on May 8, 1989, to require EPA to issue its proposal by August 31, 1989, and final decisions by February 27, 1990.

IV. Characterization of Benzene Health Risks

This section summarizes data on the health effects associated with exposure to benzene. A more complete characterization of the health effects of benzene can be found in an earlier EPA notice in the **Federal Register** [53 FR 28496, July 28, 1988] and in the Toxicological Profile for Benzene published by the EPA for the Toxic Substances and Disease Registry (ATSDR/TP-88/03).

Benzene was broadly recognized as a potential human carcinogen in the early 1970s with the publication of several epidemiological studies of benzene-exposed workers by OSHA (Docket No. OAQPS 79-3, part I, Item X-J-2).

The EPA's listing of benzene as a hazardous air pollutant under section 112 of the Clean Air Act on June 8, 1977, was based primarily on retrospective studies on occupationally exposed human populations. Of these, three reports documenting an association received the greatest emphasis: Infante et al., published in 1977, Aksoy et al., published in 1976, and Ott et al., published in 1977 (Docket No. OAQPS 79-3, part I, Items II-I-86, IV-J-16, and II-I-71). In the interval since the listing decision, additional human data and animal data have become available which further support a causal relationship. Notable in this regard are studies published in 1981 by Rinsky et al., of NIOSH (Docket No. OAQPS 79-3, part I, Item IV-J-9) providing improved follow-up of the Infante cohorts, and a study by CMA published by Wong et al., in 1983, of mortality among chemical workers exposed to benzene (Docket No. OAQPS 79-3, part I, Item X-I-I).

Infante et al., reported on a cohort occupationally exposed to benzene at two facilities manufacturing rubber hydrochloride (pliofilm). The study revealed a significant excess of leukemia deaths. Aksoy et al., reported the incidence of leukemia among Turkish shoe, slipper and handbag workers exposed to airborne benzene. Shoe workers had more than twice the rate of leukemia when compared to the incidence in the general population. Ott et al., reported the long-term mortality patterns of workers in chemical manufacturing facilities. Three deaths from leukemia were observed when only 0.8 were expected. Rinsky et al. (1981, 1987), provided a follow-up retrospective mortality study of the benzene exposed workers in the pliofilm industry (Docket No. OAQPS 79-3, part I, Items IV-J-9 and X-I-3). In the 1981 analysis, seven leukemia cases were observed as compared to 1.25 expected cases. In their 1987 analysis, nine cases of leukemia were observed when 2.7 were expected.

Wong et al., compared the causes of death for chemical workers exposed and workers not exposed to benzene. They found significant increased risk for benzene exposed workers of over four-fold when compared to nonexposed workers.

The EPA reviewed the weight of evidence of carcinogenicity from the various occupational studies and

concluded that there is sufficient human evidence of a causal relationship between benzene exposure and leukemia. Based on this evaluation, EPA has classified benzene as Group A, a known human carcinogen, following the procedures set forth in EPA's Guidelines for Cancer Risk Assessment (51 FR 33992, September 24, 1986).

In addition to leukemia, several of the studies described above noted increases in other cancers, most notably lymphosarcoma and multiple myeloma, in benzene-exposed cohorts. In these cases, however, the data are currently considered insufficient to document an association.

Toxic effects in humans, other than cancer, have been associated with benzene exposure in various epidemiologic studies of occupationally exposed populations. Effects on the human hematopoietic [blood forming] system have been documented by OSHA (Docket No. OAQPS 79-3, part I, Item X-J-2). A common clinical finding in benzene hematotoxicity is a decrease in various cellular elements of the circulating blood, termed cytopenia. This decrease can proceed to aplastic anemia, which is a rare disorder characterized by a reduction in all cellular elements in the peripheral blood and bone marrow. The OSHA has observed a case fatality rate of 30 to 50 percent within the first year of diagnosis of aplastic anemia.

Public comments on the July 28, 1988, Federal Register notice included a new quantitative risk assessment for benzene and comments on numerous assumptions on uncertainties associated with the risk assessment. The EPA's assessment of the new risk model and response to comments on the quantitative risk characterization is summarized in today's separate notice of final rulemaking for the other benzene source categories. A more detailed discussion of the assessment is given in the BID for the 1989 final decisions on those sources. In summary, EPA believes that the unit risk estimate for benzene is based on the current scientific knowledge and is the most appropriate approach at this time.

Exposure Assessment

Estimation of the potential leukemia risk associated with the emissions of benzene from industrial sources requires estimation of the concentrations of benzene to which the population may be exposed, and determination of the magnitude of population exposure. In the absence of adequate monitored ambient air levels near the industrial sources, EPA used mathematical models to predict the dispersion of emissions

and subsequent potential for human exposure.

Estimates of population exposure to benzene in the ambient air resulting from emissions from industrial sources were developed using EPA's HEM. The HEM accepts as inputs the locations and emission characteristics of the subject source categories of benzene. This information is combined with census and meteorological data contained in the model to estimate the magnitude and distribution of population exposure. Emission and plant parameters often must be estimated rather than measured, particularly in determining the magnitude of fugitive emissions, and where there are large numbers of sources that individually emit small amounts of benzene. This can lead to overestimates or underestimates of exposure. Similarly, meteorological data are not available at specific plant sites, but are available only from the closest recording weather stations that may or may not be representative of the meteorology of the plant vicinity. The dispersion modeling of the emissions usually assumes that the terrain in the vicinity of the sources is flat. For sources located in complex terrain where the surrounding topography is at higher elevation than the emission point, this assumption would tend to underestimate the maximum annual concentration of benzene, although estimates of aggregated population exposure would be less affected.

The exposure modeling also assumes that the population density in the vicinity of the source remains unchanged for 70 years and that the population is exposed for 24 hours per day for a 70-year lifetime. The exposure estimates do not consider the dynamics of population growth, decline, or mobility. This may lead to over- or underestimates of population exposure, depending on the nature of population flux. The benzene exposure assessment also assumes the industrial sources under analysis will operate for 70 years to account for potential lifetime exposures. This assumption may overestimate maximum and aggregate exposure. The degree of overstatement varies, however, among industries.

The current exposure analysis does not include an analysis of indirect exposure pathways of benzene such as dermal absorption or ingestion. Furthermore, the analysis does not include concomitant exposure that may result from pollutants co-emitted from the sources. Exclusion of such factors may underestimate total potential exposure and risk from these sources. A final uncertainty in the exposure analysis is that the current version of

the HEM does not account for potential increased maximum exposures that may result from the colocation of facilities, although EPA believes this effect would, in most cases, be very small.

Risk Characterization

The exposure estimates obtained from the HEM are combined with the estimate of carcinogenic potency for benzene ("unit risk") or URE to calculate the probability of the increased risk of cancer in the exposed population. In combining the estimates of population exposure with the URE for benzene, two measures of excess leukemia risks are calculated: the aggregate population risk, and the maximum individual lifetime cancer risk. Individual lifetime risks can also be expressed in terms of population risk distribution. The aggregate population risk, expressed as annual cancer incidence, is defined as the average number of excess cancer cases expected annually in the exposed population residing in the vicinity of the industrial sources of benzene. This measure is obtained by dividing the expected excess lifetime incidence by 70.

The MIR is defined as the probability of contracting cancer following a lifetime exposure to benzene at the maximum modeled long-term ambient benzene concentration. Estimates of maximum individual lifetime cancer risk are usually expressed as a probability represented in scientific notation as a negative exponent of 10. A risk of contracting cancer of 1 chance in 10,000 is written as 1×10^{-4} , 1 chance in 1,000,000 as 1×10^{-6} , etc. These risks, because of the uncertainties and assumptions inherent in the dose/response assessment and exposure assessment, cannot be construed as absolute measures of the true risk burden to the benzene exposed population. The quantitative risk assessment is best viewed as a relative estimate of the likelihood of cancer associated with benzene emissions from the industrial source category, for comparison with estimates from alternative emission scenarios or other benzene source categories.

The subsequent sections of this notice discuss the distribution of lifetime cancer risk and an estimate of the number of people that may fall within a particular risk interval. The risk distributions discussed are specific to benzene emissions from the industrial sources identified in this notice. Sources that are located within the HEM exposure modeling radius (e.g., 50 km) of each other would result in an overestimation of the number of people

exposed to the long-term predicted benzene concentration. However, the estimates of aggregate population risk are not affected by this particular modeling approach. That is because with a linear dose/response model, two individuals exposed to a concentration of 1 ppm benzene represent the same population risk as one individual exposed to a concentration of 2 ppm benzene.

The MIR will almost never be significantly affected by proximity of sources unless the industrial sources are located very close together. This is because the predicted benzene concentrations within the modeling radius decline quickly with distance from the emission point. In the rare cases where sources are very close in proximity (within 200 to 300 meters), the MIR may be underestimated.

The estimated distribution of individual cancer risks, however, is affected by the proximity of sources. Correction for double counting of exposed individuals would somewhat increase the individual risk for the population who are exposed to more than one source. Elimination of double counting may shift some of the population at the lower risk levels (i.e., 10^{-7}) to the next higher risk level. However, the principal effect of eliminating double counting would be a reduction in the number of people in the middle to lower risk categories.

Other factors of the quantitative risk assessment may tend to overestimate or underestimate the computed benzene risks. The relative uncertainty associated with the derivation of the cancer risk estimates can only be qualitatively discussed. The EPA currently cannot statistically describe the error range associated with each of the assumptions comprising the quantitative risk assessment. For example, the fact that the risk assessment focused only on leukemia and not other forms of cancer that have been causally linked with benzene exposure in epidemiological studies may lead to an underestimation of the overall potential cancer risk. In addition, the risk analysis excludes consideration of serious, noncancer effects associated with occupational exposure to benzene. Though it is not known whether such effects could occur at much lower ambient benzene exposures, there remains a possibility that the current analysis may underestimate the total potential population health risk. In the interest of protecting public health, however, EPA has focused on leukemia, an effect which is assumed to pose some

risk of occurring at any level of exposure.

Although benzene exposure has been associated with other cancer and noncancer effects (multiple myeloma, lymphomas, aplastic anemia, pancytopenia, depression of blood cells, and chromosomal aberrations), EPA has determined that leukemia incidence in workers provides the strongest basis for quantitative risk assessment. Departure from the assumption of nonthreshold, low dose linearity inherent in the derivation of the URE for benzene might result in different estimates (more likely lower than higher) of benzene's carcinogenic potency. The EPA does not find, however, that there is sufficient scientific evidence given the current knowledge of the mechanisms of carcinogenesis, to warrant departure from the nonthreshold and low dose linearity assumptions.

The assumptions involving the exposure assessment may tend to overestimate or underestimate risk. The dispersion modeling normally assumes flat terrain in the vicinity of the source. For sources located in rolling or complex terrain, this assumption would tend to underpredict maximum benzene exposure and MIR. Other assumptions are likely to overestimate the exposure to the most exposed subset of the population. Estimates of MIR are based on the assumption that the individual is exposed for 70 years to the estimated maximum annual average concentration and that the source continues to operate for 70 years. The degree of overestimation will vary among industries and as a function of individuals' movements.

A final factor of uncertainty in the risk assessment is the fact that the analysis does not account for individuals within the exposed population who may be uniquely susceptible to benzene carcinogenesis because of incompetent immunity, or chronic infirmity. For this subgroup within the exposed population the risks may be underestimated.

V. Policy for Developing NESHA

Under section 112 of the CAA, EPA is required to establish emission standards for hazardous air pollutants at a level that provides an ample margin of safety to protect public health. In *Natural Resources Defense Council v. EPA*, 824 F.2d 1146 (1987) (hereafter referred to as *Vinyl Chloride*), the Court of Appeals held that EPA must (1) determine a "safe" or "acceptable" risk level based solely on health factors, and (2) then set the standard at the level—which may be equal to or lower, but not higher than the "safe" or "acceptable" level—that protects public health with an ample

margin of safety. Cost and technological feasibility may not be considered in the first step, but may be considered in the second step when deciding among alternative levels that provide an ample margin of safety.

The policy for decisions on NESHA is discussed in today's separate notice presenting the final decisions for benzene emissions from maleic anhydride plants, EB/S plants, benzene storage vessels, benzene equipment leaks, and coke by-product recovery plants.

VI. Discussion of Source Categories

A. Benzene Emissions From Chemical Manufacturing Process Vents

1. Source Category Overview

Benzene is emitted through process vents from a number of chemical manufacturing process units where it is either used as a reactant, is present as an impurity in a reactant or other process feedstock, or is produced as a product or by-product. Currently, there are 3 aniline, 2 benzene sulfonic acid, 3 chlorobenzene, 1 cumene, 32 ethylene, 1 hydroquinone, 4 linear alkylbenzene, 4 nitrobenzene, and 4 phenol units that emit benzene through process vents. The February 7, 1989, court order also specified cyclohexane facilities as chemical manufacturing process units that should be considered in this source category. Also, during the course of this investigation, benzene usage was identified in resorcinol and pyridine manufacturing processes. Cyclohexane, resorcinol and pyridine manufacturing processes were investigated and found not to be emitting benzene through process vents. Thus, a total of 54 chemical manufacturing units currently emit benzene through process vents.

With the exception of ethylene units, the emission streams from process vents in all of the above manufacturing processes are continuous in nature. In ethylene plants, however, the process emissions are intermittent in nature and occur from process upsets, compressor outages, and power failures.

This source category does not include benzene emissions from ethylbenzene and styrene process vents, as these were examined previously under the EB/S source category. Nor does it include equipment leak emissions of benzene from chemical plant process units; equipment leaks of benzene have been regulated since 1984 under the standard in 40 CFR part 61, subpart J.

2. Basis for Emission Estimate

The estimated current nationwide emissions from this source category are

about 340 megagrams per year (Mg/yr). This section describes how facilities in the category were identified, how emissions were calculated, and what uncertainties are present in these estimates.

First, facilities potentially belonging to this category were identified from the SRI 1988 Directory of Chemical Producers (Docket No. A-89-03, Item II-1-2). Then, some companies were contacted to determine whether these facilities actually do use and emit benzene. For those that do, as much information was obtained as possible on their process vents, emissions, and controls. Data for one facility were obtained from a State air permit application. Site-specific emissions information obtained for individual plants is documented in Docket No. A-89-03, Items II-D-1 through II-D-11 and II-E-1 through II-E-46.

For those facilities that were either not contacted or were not able to provide complete information, various methods were used to estimate emissions. Ethylene plant emissions were estimated using the model plant methodology presented in the draft document "Benzene Emissions from Nitrobenzene, Chlorobenzene, Linear Alkylbenzene, and Ethylene Plant Vents—Background Information" (Docket No. A-89-03, Item II-A-10), together with current plant capacity data. Emissions from the other types of chemical processes, except phenol units, were estimated using model plant emission factors corrected for capacity; these emission factors were taken from the EPA document "Organic Chemical Manufacturing, Volume 7: Selected Processes" (Docket No. A-89-03, Items II-A-2 through II-A-6).

For phenol units, site-specific data were available for two facilities. Since no other methodology was available to estimate emissions from the remaining two plants, their emissions were assumed to occur at the higher level of the two units for which emissions are known and then were adjusted for capacity differences.

Uncertainties in the emission estimates vary among the individual facilities and with the way the emission estimate was derived. For annual emission estimates obtained directly from the plants, EPA has accepted the estimates, but does not know what calculation methods and assumptions were used by plant personnel, how well these reflect actual conditions, and what uncertainties might be associated with them. For facilities that provided measured hourly emission rate data, EPA assumed that these plants operate at 100 percent capacity, which is a

conservative, but presumably realistic, assumption.

Uncertainties are also present in the emission estimates based on the model plant methodologies. These estimates may be over- or underestimated, depending on how much the actual plants differ from the model plants used.

3. Control Techniques

Many process vents are known to be currently controlled using devices such as flares, incinerators, process heaters, and carbon adsorbers. These control devices, when properly designed, operated, and maintained, can achieve control efficiencies of at least 98 percent, except for carbon adsorbers which achieve at least 95 percent. The majority of process vent emissions from nitrobenzene and ethylene plants are controlled under SIPs that typically require combustion control devices.

Some additional emission reduction can be achieved for this category by controlling those vents not already controlled by a combustion device. For most of the facilities in this source category, either flares or incinerators could be applied, depending on the suitability to flow conditions and presence of acid gases. Process heaters, if already present at the facility, could also be used to limit emissions from uncontrolled vents.

4. Estimates of Exposure and Risk

Benzene emissions from chemical plant process vents were modeled using the HEM to estimate benzene concentrations and population exposures within 50 km of the facilities. Detailed documentation of the analysis is included in Docket No. A-89-03, Item II-B-6. The baseline excess leukemia risks predicted by this modeling showed a nationwide annual incidence of 0.01 case/year and a MIR of 4×10^{-5} .

5. Basis for Proposed Negative Determination

Decision on Acceptable Risk. As stated above, the baseline MIR is about 4×10^{-5} which is below the presumptive acceptable risk of approximately 1×10^{-4} . The estimated annual incidence is about 0.01 case/year. These risks are not expected to be significantly affected by the colocation of facilities. The EPA estimated that the majority of the people (greater than 99.9 percent) exposed to benzene from this source category, would be exposed to risk levels less than 1×10^{-6} . For those exposures exceeding 1×10^{-6} , the incidence is only 0.001 case/year in a modeled population of 30,000.

The EPA also considered the noncancer health effects associated with benzene exposures at levels

comparable to an MIR level of 4×10^{-5} . Benzene concentrations reported to produce noncancer health effects are two to three orders of magnitude above the exposure levels predicted for these sources. Therefore, noncancer health effects do not affect the decision.

After considering all these factors, EPA judged that the emission level at baseline represents an acceptable risk.

Decision on Ample Margin of Safety. To consider alternative emission levels, EPA examined available control technologies to reduce emissions from process vents. The two control alternatives explored represent the application of 98 percent efficient combustion control devices to process vents which are presently controlled by less efficient devices. The alternatives differ in that one (Alternative 2) applies controls to all process units, whereas the other (Alternative 1) applies controls only to vents from chlorobenzene and phenol units, which in general had higher benzene emission levels and generated greater risk.

Tables A-1 and A-2 present the control costs and emission and risk reductions achievable through the application of additional controls. As shown in the tables, both control alternatives achieve only small additional emission and risk reductions. In addition, benzene exposures reported to produce noncancer health effects are at least three orders of magnitude above the exposure levels expected under all alternatives for this source category. Furthermore, these control alternatives would only slightly reduce the estimated incidence in the population exposed to risks greater than 1×10^{-6} . Specifically, at the present level of control the number of people at risk levels greater than 1×10^{-6} is estimated to be 30,000 and the incidence in this population is only 0.001 case/year. Alternative 1 would reduce the population at greater than 1×10^{-6} risk to 20,000 and the cancer incidence estimated for this population group would be only 0.0004 case/year. More than 80 percent of the total incidence reduction of 0.003 case/year would occur in the 60 million people exposed to risks below 1×10^{-6} . Alternative 2 would eliminate exposures to risk greater than 1×10^{-6} and the incidence would be about 0.0004 case/year for this population of 60 million. These additional control levels would cost about \$2.8 million and \$39 million per year (1984 dollars). While these additional costs are relatively small, they are disproportionately large in comparison to the small additional emission and health risk reduction achieved.

TABLE A-1.—CHEMICAL MANUFACTURING PROCESS VENTS: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/year)	Incremental incidence reduction
Baseline	4×10^{-5}	0.01	
1	1×10^{-5}	0.008	0.004
2	1×10^{-6}	0.0004	0.007

Note: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

TABLE A-2.—CHEMICAL MANUFACTURING PROCESS VENTS: CONTROL OPTION IMPACTS

Alternative	Annual cost \$MM/yr (1984)*	Benzene reductions, mg/yr	Incremental benzene reductions, mg/yr
Baseline			
1	2.8	34	34
2	39	214	175

* SMM is millions of dollars. The dollar year is 1984.

Regulatory Status

Majority of process vents are currently controlled under SIP's.

Description of Alternatives

Baseline: No rule. Emissions are about 340 Mg/yr of benzene.

Alternative 1: Require 98 percent efficient combustion control on vents from process units manufacturing chlorobenzene or phenol.

Alternative 2: Require 98 percent efficient combustion control of all vents from process units using benzene.

Based on these factors, EPA decided that the baseline level of control protects the public health with an ample margin of safety. The EPA is, therefore, proposing not to regulate chemical manufacturing process vents under Section 112 of the CAA (this is called a negative determination).

6. Impacts of Proposed Standard

Since no standard is proposed, there will be no impacts.

B. Benzene Category Operations

1. Source Category Overview

Benzene emissions from transfer operations occur at certain chemical production facilities, bulk terminals, and coke by-product recovery plants from the loading of rail tank cars, tank trucks, and marine vessels. Emissions of benzene from transfer operations are a composite of losses from vapors formed in the empty receiving vessel by the evaporation of residual product from previous loads and vapors generated in

the vessel as the new product is being loaded. The source category includes the loading of pure benzene and mixtures containing benzene that are recovered at coke by-product plants from coke oven gases. These mixtures typically contains about 76 percent benzene.

Through this investigation, approximately 110 benzene transfer operation emission sources within these categories were identified. This includes 73 production facilities, 8 bulk terminals, and 30 coke by-product recovery plants. Benzene emissions from these sources have not previously been regulated by any Federal standards; however, some States do have regulations which would apply to transfer operations where benzene is emitted.

2. Basis for Emission Estimate

Nationwide uncontrolled benzene emissions from transfer operations are estimated to be approximately 4,600 Mg/yr. This section describes how the nationwide estimate was determined, including how facilities in the category were identified, how emissions were calculated, and what uncertainties are present in these estimates.

Transfer operation sources were identified from available directories listing chemical production facilities and from information previously gathered by EPA and located in EPA files (see Docket No. A-89-04, Item II-1-4). A representative number of individual sites were then contacted by telephone to obtain information on the amount and composition of benzene loaded, the type of receiving vessel, and the loading method. Where such information was unavailable for a particular site, estimates were made using engineering judgment, as discussed below. Benzene emissions were then estimated based on loading loss equations contained in "Compilation of Air Pollutant Emission Factors" (AP-42). A complete explanation of the approach and assumptions used in estimating emissions may be found in Docket No. A-84-04, Item II-B-6.

With respect to benzene throughput for each facility, specific data on annual throughput was not obtained via the telephone survey for every facility. Therefore, engineering judgment was used to develop the throughput for each facility type. For bulk terminals, sufficient throughput information was available from the telephone survey. The average throughput approach was also used to generate the facility throughput for benzene producers. For coke by-product recovery facilities, only limited throughput information was obtained during the telephone survey. However, coke capacity data were

available for each facility. An average ratio was developed for benzene throughput versus coke capacity. This ratio factor was multiplied times the coke capacity to determine the benzene throughput for each facility not contacted during the telephone survey.

For determining the type of receiving vessel, information gathered from the telephone survey was extrapolated to the entire list of sources under each transfer operation type. For benzene producers which were not contacted, it was assumed that 50 percent of the total quantity of benzene transferred was transported by marine vessels and 50 percent was transferred using railcars. Based on the industrial contacts, 100 percent railcar loading was assumed for all coke by-product plants.

For loading method, it was assumed that all transfer operations employed submerged loading. This type of loading produces lower emissions than other methods. Marine vessels use only submerged loading. Standard practice for railcars is to toplead with a submerged pipe. Standard practice for tank trucks is to toplead with a submerged pipe or to bottom load. It is highly unlikely for tank trucks to top splash load for organics such as benzene.

There are several uncertainties present in the emission estimates. First, the number of benzene transfer facilities is uncertain. Although the estimated number is believed to represent the vast majority of facilities that currently exist, it is possible that some smaller benzene producers could have been overlooked due to time constraints. Alternatively, it is also possible that some benzene transfer facilities identified in this study may no longer be in operation. Therefore, it is not known whether the uncertainty in the number of facilities tends to overstate or understate emissions.

Other uncertainties exist in the industry profile data, including the benzene throughput, receiving vessel type, loading method, and presence of a vapor balance system. Overall, EPA believes that reasonable assumptions were made in light of available information such that emissions would be neither overstated nor understated.

3. Control Techniques

The EPA surveyed some of the benzene transfer operations and found that only one facility (of those surveyed) currently has controls in place. Based on these findings and discussions with industry representatives, EPA assumed that all facilities included in this source

category are uncontrolled (except for the one identified controlled facility).

Control of benzene emissions from transfer operations can be accomplished by collecting and routing benzene vapors displaced from the receiving vessel to an add-on control device. Such devices include incinerators, carbon adsorbers, flares, and condensers. In all cases, a vapor recovery system would have to be installed. The efficiencies of these controls when properly designed, maintained, and operated are typically 98, 95, 98 and 90 percent, respectively.

4. Estimates of Exposure and Risk

Benzene emissions from benzene transfer operations were modeled using the HEM to estimate benzene concentrations and population exposures within 50 km of the facilities. Detailed documentation of the analysis is included in Docket No. A-89-04, Item II-B-5. The baseline excess leukemia risks predicted by this modeling showed a nationwide annual incidence of 1 case/year and a MIR of 6×10^{-5} .

5. Basis for Proposed Standard

Decision on Acceptable Risk. The baseline MIR of 6×10^{-5} for benzene transfer operations is unacceptable for benzene, a known human carcinogen. The EPA examined several alternatives in deciding what constitutes an acceptable risk level. These alternatives and the risks are illustrated in Table B-1. After examining these different alternatives and their associated risk distributions, EPA has decided that Alternative 1 represents a risk that is acceptable for benzene transfer operations after considering several factors.

TABLE B-1—BENZENE TRANSFER OPERATIONS: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/year)	Incremental incidence reduction
Baseline	6×10^{-5}	1	
1	4×10^{-6}	0.02	1
2	7×10^{-6}	0.009	0.01
3	1×10^{-6}	0.007	0.002

NOTE: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

Control to the level of Alternative 1 would reduce the MIR to about 4×10^{-5} and the annual incidence to 0.02. The majority of the people (greater than 99.9 percent) exposed to benzene emissions from this category would be exposed to risk levels lower than 1×10^{-6} . It is estimated that about 40,000 people would be exposed to risk levels between

4×10^{-5} and 1×10^{-6} and the incidence in this group would be only 0.001 case/year. In estimating these risk levels, EPA has not found that colocation of facilities significantly affects the magnitude of the MIR. The EPA also considered the noncancer health effects associated with benzene exposures expected after application of Alternative 1 or at exposures comparable to an MIR of 4×10^{-5} . Noncancer health effects have been associated with exposure to benzene, but exposure levels reported to produce noncancer health effects are at least three orders of magnitude above the levels of exposure expected after application of Alternative 1.

After considering all these factors, EPA judged the emission level associated with Alternative 1 to be acceptable.

Decision on Ample Margin of Safety. The EPA considered selecting a level of emissions more stringent than that associated with the acceptable risk to provide an ample margin of safety. To reduce the complexity of studying the costs and benefits of different combinations of control options, EPA defined the maximum controls that are technically feasible and which could be applied to transfer operations at producers, bulk terminals, and coke by-product recovery plants. Alternative controls were then defined based on which of these sources within the category that the maximum controls were applied. Alternative 1 involved maximum control of producers and terminals only. Alternative 2 applied maximum controls to coke by-product plants as well as producers and terminals. To achieve risks of less than 1×10^{-6} , Alternative 3 placed a limitation on benzene throughput in addition to the controls of Alternative 2. Table B-2 presents the control costs and emission reductions associated with these alternatives.

TABLE B-2.—BENZENE TRANSFER OPERATIONS: CONTROL OPTION IMPACTS

Alternative	Annual cost \$MM/yr (1987)*	Benzene reductions, mg/yr	Incremental benzene reductions, mg/yr
Baseline			
1	30	4,330	4,330
2	34	4,380	50
3	34*	4,400	20

* SMM is millions of dollars. The dollar year is 1987.

** Annualized cost of required controls. There may be costs and economic impacts associated with the emission cap which would require reduced throughput at the larger facilities.

Regulatory Status

Benzene transfer operations are largely uncontrolled.

Description of Alternatives

Baseline: No rule. Emissions are about 4,600 Mg/yr of benzene.

Alternative 1: Incineration (98 percent control) of benzene transfer emission at producers and terminals.

Alternative 2: Incineration (98 percent control) of benzene transfer emission at producers, terminals and coke by-product plants.

Alternative 3: Incineration (98 percent control) of benzene transfer emissions at producers, terminals, and coke by-product plants, and an emission limit of 1,150 kg/yr.

In comparing Alternative 1 with Alternatives 2 and 3, EPA found that the alternatives provide essentially the same level of protection. While each alternative reflects a significant reduction from the baseline uncontrolled level, control beyond Alternative 1 achieves only small additional risk and emission reductions. For example, with Alternative 2 the total nationwide incidence would be reduced from 0.02 case/year to 0.009 case/year. Most (about 90 percent) of this reduction is associated with exposures to risk levels below 1×10^{-6} . The number of people estimated to be exposed to risk levels greater than 1×10^{-6} would be only reduced from 40,000 to 3,000 under Alternative 2. Alternative 3 eliminates exposures to risks greater than 1×10^{-6} but does not reduce the incidence. For all three alternatives the proportion of the population at risk levels below 1×10^{-6} exceeds 99.9 percent. In addition, benzene exposures reported to produce noncancer health effects are at least three orders of magnitude above the exposure levels expected under all alternatives examined for this source category.

The controls required by Alternatives 2 and 3 would cost \$35 million (1987 dollars) per year, an increase in annual control costs of \$4 million over the costs of Alternative 1. Because the costs of Alternatives 2 and 3 are disproportionately great compared to the small additional emission and health risk reductions achieved, EPA has determined that it is not necessary to reduce small additional emission and health risk below the acceptable level. Therefore, EPA decided that the emission control requirements of Alternative 1 will protect the public health with an ample margin of safety.

Summary and Basis for Format of Standards. The standard for benzene

use at bulk transfer facilities requires a 98 weight-percent reduction of benzene emissions and requires that loading of benzene be limited to vapor-tight tank trucks, railcars, or marine vessels. The standard exempts facilities with an annual throughput of less than 1.3 million liters (0.3 million gallons) of benzene and those facilities loading material consisting of less than 70 weight-percent benzene. The annual throughput cutoff exempts facilities that may only load benzene periodically throughout the year from being subject to the percent reduction requirement. The cutoff by benzene concentration exempts loading operations such as gasoline that are covered under other standards.

The 98 percent value is based on the typical performance of an incinerator or a flare, which are universally applicable to facilities expected to be subject to this standard. Available test data indicate that properly designed, operated, and maintained incinerators or flares can achieve at least a 98 weight-percent reduction of organic compounds. Although the standard is based on the use of an incinerator or flare, any control device may be used as long as a 98 weight-percent reduction is achieved. Vapor-tight vessels are required to limit the fugitive emissions from this source category. A weight-percent reduction standard was considered feasible since the necessary data for calculating this value could be readily available to the owner or operator of an affected facility.

6. Impacts of Proposed Standard

Under the proposed standard, benzene emissions from this source category will be reduced from a baseline level of 4,600 Mg/yr to an estimated 270 Mg/yr. This represents a reduction of approximately 94 percent. The residual incidence of leukemia from exposure to benzene emissions after application of this standard is estimated to be 0.02 case/year, and the MIR is predicted to be 4×10^{-5} . This can be compared with an incidence of 1 case/year and a MIR of 6×10^{-3} under baseline conditions.

Potential environmental impacts of this standard depend on the control device selected by each facility to attain compliance. Incinerators and flares are not expected to produce any wastewater or solid waste impacts. However, if carbon adsorbers are used, some minor wastewater and solid waste impacts can be expected from desorption of the carbon beds with steam, and then the final disposal of spent carbon. Because it is not known how many benzene transfer facilities will employ carbon absorbers, rather than incinerators or

flares, to comply with the standard, the wastewater and solid waste impacts of this standard cannot be quantified at this time. However, because of regulations being developed under other Acts such as RCRA and the Clean Water Act, and the regulations being considered for benzene waste, these impacts are expected to be small. No changes in energy use are predicted.

National capital costs of control associated with achieving the standard are \$167 million (in 1987 dollars). The nationwide annual cost is \$30 million/year (in 1987 dollars).

7. Request for Comments

Because there are no standards for determining the vapor tightness of marine vessels and limited experience in the determination of vapor tightness of marine vessels, EPA is requesting public comment on the methods of determining the vapor tightness of marine vessels. As proposed, the vapor tightness of a marine vessel can be demonstrated by Method 21, by a pressurized air or inert gas test, by operating the marine vessel at negative pressure, or by an alternative procedure approved by the Administrator. The EPA is interested in comments and data on the comparability of these methods.

Also, Methods 25A and 25B, which do not identify specific compounds, have been cited as the methods by which to measure average benzene concentration upstream and downstream of control devices. These methods have been referenced, assuming that most of the organics passing through control devices applied to this source category will be benzene in the vapor phase (facilities loading material containing less than 70 percent benzene are exempt from the standard). The EPA is requesting comments on the appropriateness of using Methods 25A and 25B, and whether other, compound-specific methods would be preferable.

To reduce the number of control options, EPA defined the maximum controls that could be applied to benzene transfer operations at producers and bulk terminals. The EPA solicits comments on the emission reductions and control costs of other available control options.

C. Industrial Solvent Use

1. Source Category Overview

This source category includes the use of benzene as an azeotropic agent, distilling agent, reaction solvent, extracting agent, and recrystallizing agent, as well as the more typically pictured use as an agent to dissolve other substances. Facilities presently

known to be using benzene as a solvent include pharmaceutical manufacturing, general organic synthesis, alcohol manufacturing, caprolactam production, and plastics, resins and synthetic rubber manufacturing. A total of 10 plants of these types have been identified as currently using and emitting benzene as a solvent. In addition to these uses, benzene is present in small quantities in solvents used in the rubber tire manufacturing industry. In the above-mentioned industries, solvent benzene is emitted to the atmosphere through process vents, dryer vents, and building ventilation systems.

Solvent emissions of benzene had been previously reported from the manufacture and use of pesticides, use of printing inks, application of surface coatings, and various other uses. However, these uses of benzene were investigated and were found to have ceased (Docket No. A-89-05, Item II-B-6).

Because of OSHA and other regulations concerning benzene that have gone into effect, benzene solvent use has declined or stopped in many plants during the past 10 years. Some of the facilities included currently in this source category indicated that they plan to eliminate benzene solvent use within the next several years.

2. Basis for Emission Estimate

Total nationwide emissions of benzene from the solvent use category are estimated at approximately 450 Mg/yr. This section describes the development of this emission estimate and estimates for individual facilities, including identification of the facilities, calculation of emissions, and a discussion of uncertainties involved.

Facilities that emit benzene from solvent uses were identified through a literature survey and through the 1987 SARA 313 emissions inventory (see Docket A-89-05, Item II-B-6). After a list of facilities potentially using benzene as a solvent was compiled, individual companies were contacted to verify benzene use, emission sources, level of emissions, and current controls. Plant-specific emissions estimates for the facilities that confirmed solvent use were developed directly from the SARA 313 reported stack emissions. One plant reported emissions from multiple uses of benzene and could not separate the solvent use from the remaining emissions. However, plant personnel did know the amount of benzene currently used as a solvent per year. For this plant, it was conservatively estimated that all of the benzene consumed in solvent uses

each year was emitted to the atmosphere.

The rubber tire manufacturing industry uses solvents containing trace amounts of benzene. Although the quantity of benzene contained in the solvent is small, typically 0.3 percent, significant emissions could be generated depending on the amount of solvent used. To assess the maximum potential emissions from an individual plant, the largest tire manufacturing facility was identified using information in the Rubber Tire BID. Solvent use emissions of benzene for that plant were estimated based on estimated tire production (in 1986), process VOC emission factors (in grams/tire) taken from the Rubber Tire BID, and a benzene level of 0.3 percent in the solvent. These emissions were then extrapolated to the remaining 53 tire manufacturing facilities based on their estimated proportional share of the total 1986 nationwide tire production.

As with all estimates, the emission estimates developed for this source category contain uncertainties. The information on tire production, percentage of benzene contained in the solvent, and emissions factors used for the particular tire manufacturing facility discussed above could either over- or underestimate emissions depending on how well it actually reflected conditions at that plant. The range around the estimated tire manufacturing emissions of benzene from this facility is likely a factor of approximately two higher or lower than the estimate used. An underestimation by a factor of 2 would mean that the actual MIR from this facility would be a factor of 2 higher than predicted.

Extrapolation of the emissions from this tire plant to all tire plants in the United States could also over- or underestimate emissions depending on how representative the 1986 tire production numbers are for 1989 production, and how representative earlier solvent use per tire estimates are of present operations and controls.

Of the remaining nine general organic synthesis facilities and one pharmaceutical manufacturing plant included in the solvent use category, emissions estimates for nine of these were based on SARA 313 reported emissions. Exclusion of plants that were too small to have reported benzene emissions under SARA or were otherwise overlooked would cause emissions to be slightly underestimated. The emissions for those facilities that did report are assumed to have been accurately calculated by plant personnel. Errors made or assumptions used in the calculations could cause these emissions to be either over- or

underestimated depending on the specific computation methodology used by each individual plant. In addition, changes in benzene use at the facilities could affect the estimate. The one other general organic synthesis plant, whose emissions were estimated by assuming that all solvent benzene used is emitted, has been treated conservatively.

3. Control Techniques

Currently, three of the facilities using benzene as a solvent are known to use control devices to reduce their emissions. The control devices reported by the three facilities include carbon adsorbers, condensers, and incinerators. The other facilities included in this category either are known not to have control devices or, in the absence of site-specific information, were assumed not to be using them.

Control devices that are typically used to reduce emissions from the types of operations in this source category include incinerators and carbon adsorbers, with efficiencies of 98 and 95 percent, respectively, when well designed, operated, and maintained. Incinerators were assumed to be generally applicable to facilities using benzene in general organic synthesis operations.

Pharmaceutical manufacturing typically involves batch processes and therefore intermittent emissions. Carbon adsorbers are the most commonly used control for this type of facility. Incinerators can be used in some cases, but are not common.

The tire manufacturing operations which involve benzene solvent use may be conducted in open areas to allow worker access. The benzene emissions are therefore fugitive in nature, and a capture system must be installed to collect vapors and route them to a control device. The capture efficiency of such systems when applied to tire manufacturing processes is about 65 to 85 percent. Therefore, the capture and associated incinerator control systems are expected to achieve an overall efficiency of 75 percent when applied to tire production solvent use emissions.

4. Estimates of Exposure and Risk

Benzene emissions from industrial solvent use were modeled using the HEM to estimate benzene concentrations and population exposures within a 50 km radius of the facilities. Detailed documentation of the analysis is included in Docket No. A-89-05, Item II-B-7. The baseline risks predicted by this modeling showed a nationwide annual excess leukemia incidence of 0.02 case/year and a MIR of 3×10^{-5} .

Risks from tire manufacturing emissions of benzene were determined by modeling the largest tire manufacturing plant and extrapolating the risks from this plant to the rest of the industry based on production ratios.

5. Basis for Proposed Standard

Decision on Acceptable Risk. As stated earlier, the baseline MIR is about 3×10^{-5} which is below the presumptive acceptable risk of approximately 1×10^{-4} . The estimated annual incidence is about 0.02 case/year. These risks are not expected to be significantly affected by the collocation of facilities. The majority of the people (greater than 99 percent) would be exposed to risk levels lower than 1×10^{-6} . For those exposures at risk levels exceeding 1×10^{-6} , the cancer incidence is only 0.006 case/year in an estimated population of 200,000.

The EPA also considered the noncancer health effects associated with benzene exposures at levels comparable to an MIR level of 3×10^{-5} . Benzene concentrations reported to produce noncancer health effects are about three orders of magnitude above the exposure levels predicted for these sources. Therefore, noncancer health effects do not affect the decision on acceptability. After considering all these factors and the uncertainties in the estimates, EPA judged that the emission level at baseline represents an acceptable risk.

Decision on Ample Margin of Safety. To consider alternative emission levels, EPA examined available control technologies to reduce emissions from the different categories of solvent users. The EPA first examined the alternative of the application of best control to all facilities. Application of controls to all sources would reduce risks from 3×10^{-5} to 1×10^{-6} and the incidence from 0.02 to 0.002 case/year. Tables C-1 and C-2 present the risk reductions and the control costs and emission reductions achievable through the application of the best controls on these sources.

TABLE C-1.—INDUSTRIAL SOLVENT USE: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/year)	Incremental incidence reduction
Baseline	3×10^{-5}	0.02	
1	1×10^{-6}	0.002	0.02

NOTE: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

TABLE C-2.—INDUSTRIAL SOLVENT USE:
CONTROL OPTION IMPACTS

Alternative	Annual cost \$MM/yr (1984)*	Reductions, Mg/yr		Incremental reductions, Mg/yr	
		BZ ^b	VOC ^b	BZ	VOC
Baseline....					
1	14.4	416	41,500	416	41,500

* \$MM is millions of dollars. The dollar year is 1984.

^b BZ is benzene. VOC is volatile organic compounds, including benzene.

Regulatory Status

Present regulatory status under SIP's is unknown.

Description of Alternatives

Baseline: No rule. Benzene emissions are 450 Mg/yr, and VOC emissions are 41,500 Mg/yr, including benzene.

Alternative 1: Require 95 percent control for pharmaceutical manufacturing, 75 percent for tire manufacturing (NSPS), and 98 percent for general organic synthesis industries.

After considering the control costs, technical feasibility, and the benefits of control of benzene and cocontrol of other pollutants, EPA has concluded that it is appropriate to require application of additional controls to two of the groups of sources. These sources are tire manufacturing facilities and pharmaceutical facilities. The factors considered in making this judgment were: (1) the cost of control relative to the risk reduction achieved, (2) possible understatement, in some cases, of emissions from rubber tire manufacturing plants, and (3) controls would also reduce emissions of pollutants contributing to urban air toxics problems.

Control of these sources would reduce the total cancer incidence from these sources by about 0.02 case/year and would reduce the number of people at risk levels greater than 1×10^{-6} from approximately 200,000 to approximately 10,000. The incidence in this population group would be reduced from about 0.005 case/year to about 0.0002 case/year. More than 90 percent of the remaining incidence of 0.003 case/year would be associated with exposures to risk levels below 1×10^{-6} . Additionally, more than 99.9 percent of the 20 million people exposed to these sources are at risks less than 1×10^{-6} . Benzene exposures reported to produce noncancer health effects are at least three orders of magnitude above the exposure levels expected for these sources. Application of these controls is estimated to cost about \$12 million/year (1984 dollars).

In conclusion, EPA decided that control of these sources would provide an ample margin of safety. Therefore, EPA is proposing standards to limit emissions from tire manufacturing and pharmaceutical manufacturing as described in the next section.

Standards are not being proposed for the other facilities using benzene as a solvent. For these sources, the risks are about 3×10^{-5} and 0.002 case/year, and the MIR estimate is considered to reflect an upperbound estimate of potential emissions from the facility. Fewer than 100 people are estimated to be exposed to risks greater than 1×10^{-5} , with an incidence of 0.00002 case/year. In addition, more than 99.9 percent of the population exposed to benzene from these sources is exposed to risk levels below 1×10^{-6} . More than 90 percent of the total incidence of 0.002 case/year is associated with the large population at risk levels below 1×10^{-6} . Additional control is not considered warranted because the costs are high relative to the risk reduction achieved. For these reasons, EPA has concluded that a Federal standard is not warranted for solvent use in industries other than the tire manufacturing and pharmaceuticals.

Summary and Basis for Formats of Standards. The proposed rubber tire manufacturing standard requires plants to either achieve a 75 weight-percent reduction in emissions of benzene from solvent use using an emission capture system and a control device (e.g., incinerator or carbon adsorber), or to reduce their emissions to 1,500 kg/yr. or less. The standard only requires plants using less than 1,500 kg/yr of benzene as a solvent to document their solvent usage and the percent benzene in the solvent(s).

The control devices currently in use at tire manufacturing operations yield an overall efficiency of 75 percent, as discussed previously. Therefore, the standard has been written to require plants to achieve this level of control. Although the standard is based on a combination of capture and control using incineration or carbon adsorption, any combination of capture and control devices may be used as long as an overall 75 weight-percent reduction of benzene is demonstrated.

It was also recognized, however, that some plants may use less than the average amount of solvent in manufacturing tires or may already have reduced their benzene emissions by either purchasing solvents with an extremely low concentration of benzene (0.1 percent or less), or by substituting water-based cements or tire sprays for organic solvent-based cements or tire

sprays. In order to give these facilities credit for this and still achieve the goal of an acceptably low risk, an alternative to the 75 percent control is given by allowing facilities to demonstrate that they emit less than 1.5 Mg/yr of benzene from solvent use.

The standard for benzene solvent use at pharmaceutical facilities requires a 95 weight-percent reduction of benzene. A weight-percent reduction standard was used for this source category because it can be determined from measurements of flowrate and control device inlet and outlet benzene concentration. However, to credit process design changes that prevent or minimize pollution, an alternative to the 95 weight-percent reduction is also provided. This alternative standard allows facilities to comply by demonstrating that process vent emissions are less than 1 Mg/yr.

The 95 percent value is based on the typical performance of carbon adsorption systems, which are universally applicable to facilities expected to be subject to this standard. Available test data indicate that properly designed, operated, and maintained carbon adsorbers can achieve at least 95 weight-percent reduction of organic compounds.

Although the standard is based on carbon adsorption, any type of control device may be used as long as a 95 weight-percent reduction of benzene is demonstrated.

6. Impacts of Standards

Under the standards summarized above, benzene emissions from tire manufacturing and pharmaceutical manufacturing will be reduced from an estimated baseline level of 129 Mg/yr to approximately 30 Mg/yr. This represents a reduction of approximately 76 percent in the benzene emissions from these two types of facilities. For the entire source category, with baseline emissions of 454 Mg/yr, this represents a 21 percent reduction to a level of 357 Mg/yr. The residual incidence for the source category after application of these standards is estimated to be 0.005 case/year, and the MIR is predicted to be 3×10^{-5} of this total, the uncontrolled sources contribute 0.002 case/year incidence and a MIR of 3×10^{-5} . This can be compared with an incidence of 0.02 case/year and an MIR risk of 3×10^{-5} under baseline conditions.

Because carbon adsorbers might be used to comply with the proposed standards for pharmaceutical and tire manufacturing plants, some wastewater and solid waste impacts can be expected from desorption of the carbon beds with steam, and the final disposal

of spent carbon. However, because of regulations being developed under other Acts such as RCRA and the Clean Water Act and the regulations being considered for benzene waste, these impacts from the pharmaceutical and tire regulations are expected to be small. The use of incinerators is not predicted to have such impacts. No changes in energy use are predicted.

National capital costs of control associated with achieving these standards are \$23 million (in 1984 dollars). The nationwide annual cost is about \$12 million/year (in 1984 dollars). This represents the combined costs of using carbon adsorbers at pharmaceutical facilities and incinerators at the tire manufacturing facilities.

7. Request for Comments

The EPA is requesting public comment on whether the emission estimates for rubber tire manufacturing facilities are underestimated. The EPA also solicits comments on the emission reductions and costs of alternative control requirements.

In decisions on control levels to provide an ample margin of safety, EPA includes consideration of the appropriate balance among the benefits of control of hazardous air pollutants, cocontrol of other pollutants, cost and technical feasibility. A significant factor in the judgments on this source category was the cocontrol of VOC achieved by the alternatives in addition to the primary benefit of reducing benzene. However, this was not the only consideration. Additional considerations included the benefits of controlling sources of urban air toxics, and of maintaining or improving air quality. Because VOC cocontrol would be a significant effect of these NESHAP, EPA is interested in public comment on how VOC cocontrol should be considered in decisions on ample margin of safety, particularly when the risk and risk reductions are small.

D. Benzene Waste Operations

1. Source Category Overview

Benzene is produced primarily by petroleum refineries and chemical plants using catalytic reforming, naphtha cracking (for pyrolysis gasoline), and toluene hydrodealkylation processes. Benzene also can be derived from the light oil produced at some coke by-product recovery plants. The major use of benzene recovered from petroleum and coal sources is as a feedstock, reactant or intermediate in the manufacture of other chemicals (mainly

ethylbenzene, cumene, and cyclohexane) and end products.

This assessment examines the health and environmental impacts of benzene emissions from industrial waste operations. "Waste" is defined as any material resulting from industrial, commercial, mining or agricultural operations, or from community activities that is discarded or is being accumulated, stored, or physically, chemically, thermally, or biologically treated prior to being discarded, recycled, or discharged. Waste materials containing benzene that are recycled are included in this definition because of potential emissions from the recycling process. Wastes containing benzene generated by chemical plants, petroleum refineries, and coke by-product recovery plants may be treated onsite, discharged to a publicly owned treatment works, or accumulated for offsite shipment to a commercial hazardous waste treatment, storage, and disposal facility (TSDF). Because commercial TSDF's and CERCLA (Superfund) cleanup sites may receive or generate benzene-laden wastes for treatment and disposal, they also are included in the scope of this assessment. Although EPA's analyses focus on chemical plants, petroleum refineries, coke by-product recovery plants, and commercial TSDF's, any standards placed on benzene waste operations would be applicable to any waste containing benzene.

In general, the majority of benzene air emissions from waste management processes are released from storage or treatment operations conducted in open or covered tanks or in surface impoundments. Treatment operations include (but are not limited to): chemical or biological operations; separation processes such as oil/water separation, steam or air stripping, TFE, fractionation, or solvent extraction; destruction technologies such as incineration; and fixation/stabilization processes. Emissions also are released due to handling operations (including loading and filling of drums, dumpsters, tank cars or tank trucks) and storage of wastes in containers. Benzene emissions also may be released from waste disposal operations involving wastepiles, land treatment, landfills, and injection wells.

2. Basis for Emission Estimate

Benzene emissions are released to the air from waste operations as a result of storing, treating, transferring, or disposing of the waste in various types of units. The quantity of waste at a facility and the benzene concentration in the waste define the quantity of benzene in the waste and place an

upper bound on the benzene emission potential. Whether the benzene is present in aqueous wastes or organic wastes is important because of the effect on the volatility of benzene and potential emission rates. In addition, knowledge of the types and sequence of storage, treatment, and disposal processes is needed to estimate the quantity of benzene likely to be emitted. These and other types of information were assembled from a variety of existing data sources to provide the basis for the emission estimates underlying today's proposed standards.

a. Emission Source Data. Waste management processes and the quantity of resultant air emissions differ widely among facilities and industries. Waste operations at chemical plants, petroleum refineries, coke by-product recovery plants, and commercial TSDF's are estimated to emit approximately 5,300 Mg/yr benzene. Emission measurements were not made at the facilities; however, the estimates are based on typical emission factors and data supplied by the facilities, such as information on waste quantity, concentration, and types of waste processing. A detailed site-specific analysis of any facility in the data base could result in emission estimates significantly different from EPA's estimates.

The EPA's data base for this assessment includes 390 facilities that have waste streams containing benzene. The benzene emissions from waste operations range from very low levels to high levels at some facilities. Although all facilities or waste streams containing benzene may not be included, the benzene data base encompasses the facilities and wastes likely to account for the majority of potential benzene emissions from waste operations. Following is a brief description of the data sources used, the methodology used to estimate emissions, and the associated uncertainties. Additional information is provided in the detailed documentation included in Docket A-89-06, Item II-B-2.

To develop the data base for benzene waste operations, EPA reviewed existing data sources to identify waste streams that contain benzene. For facilities with benzene wastes, information was compiled on the quantity of waste; the type of waste (organic or aqueous); the benzene concentration in the waste; and the types of units used to store, treat, or dispose of the waste. These four items provide the basic data needed to estimate benzene emissions from waste operations. The data sources did not provide complete information for every

waste stream at each facility. When needed, estimates and engineering judgments were made by EPA to fill data gaps.

Five existing EPA data sources served as the primary sources of information for the assessment. The majority of these data were supplied by industry through questionnaires that were completed by the facility and submitted to EPA. These data were gathered by EPA to characterize hazardous wastes, the processes that generate them, and how they are managed to support the development of regulations under RCRA, as amended. The ISDB was developed by EPA in the early 1980's from site visit reports, measurements, and questionnaire responses from facilities that generate hazardous wastes. The ISDB contains information on approximately 1,500 waste streams generated at 370 facilities. The EPA also compiled similar data for petroleum refineries that is referred to as PRDB. For the purposes of the benzene waste analysis, data were identified for 164 facilities from the ISDB and the PRDB. Another major source of data was EPA's 1987 National Survey of Hazardous Waste Generators (Generator Survey). Responses from the Generator Survey were received from the 1,000 largest hazardous waste generators in the United States, a stratified sampling of the remaining generators, and most hazardous waste TSDR. Complete data on benzene wastes were obtained for another 114 facilities from this survey. Prior to the Generator Survey, EPA also conducted a survey in 1986 of approximately 3,000 hazardous waste TSDR. The 1986 TSDR Survey provided benzene waste information on an additional 75 facilities that were not included in the other sources of data.

The 1986 TSDR survey and a portion of the PRDB did not contain data on the concentration of benzene in the wastes. However, information was available from these sources on the waste code, quantity, and types of processes. To use these data to estimate emissions, average benzene concentrations were generated from the concentration data in the Generator Survey results for combinations of RCRA waste codes, waste forms, and SIC codes. These average concentrations were applied to facilities identified in the PRDB that had missing concentration data and to the facilities in the 1986 TSDR Survey. Concentration data were available for approximately 75 percent of the wastes (based on waste quantity) in the benzene data base. The remaining 25 percent of the wastes were assigned

average concentration values as described above.

An additional data source used to assess benzene waste was an EPA study conducted from 1978 to 1980 to verify the occurrence of specific priority pollutants in wastewater from a variety of processes in the organic chemicals, plastics, and synthetic fiber industry. This data source contained information on 37 plants, and 13 of these were identified as having benzene in their wastewater. For these plants, data were available for benzene concentration, waste quantity, and type of processing. Additional data on benzene in wastewater were obtained from the EPA development document for effluent limitations for the cokemaking subcategory of the iron and steel industry. This document provided both an average and a range of benzene concentrations in raw wastewater at coke by-product recovery plants and the amount of wastewater produced as a function of the coke capacity. The average values were used to estimate waste quantities and benzene concentrations for 24 coke by-product recovery plants that were not included in the other sources of data.

b. Estimates of Fraction Emitted. After compiling the data base on benzene waste operations, the next step was to estimate how much of the benzene in the waste would be emitted, given the type of waste and the process unit used for handling the waste. The emission factors used in this analysis were based on previous work done by EPA in developing air emission standards for hazardous waste TSDF's and in developing guidance for control of industrial wastewater treatment systems. The emission factors, expressed as the fraction of benzene in the waste that is emitted, were developed for 12 types of emission sources: containers, filtration, incineration, landfills, land treatment, oil/water separators, solidification, surface impoundments, tanks, truck loading, waste piles, and wastewater treatment systems. The estimated fraction of the benzene in the waste that is emitted in these sources ranged from less than 1 percent (e.g., for containers, truck loading, incineration) to high values approaching 100 percent for open sources (such as wastewater treatment, surface impoundments, and land treatment). Estimates from the April 1989 draft CTC on industrial wastewater treatment revealed that 94 to 99 percent of volatiles such as benzene are emitted in the wastewater treatment system. This estimate includes the entire transport and treatment train from the

first process drain to the final effluent. Surface impoundments are also open sources that are estimated to emit most of the benzene in the waste. Estimates from the March 1988 hazardous waste TSDF draft information document indicated that roughly 50 to 100 percent of the benzene would be emitted when the waste is placed in a surface impoundment. For land treatment, the estimates ranged from 85 to 100 percent.

These emission factors are average values derived from a range of values for specific units. Depending on the unit's design and operation, the emission factor for a specific process at a given facility may be higher or lower. The emission factors are based on model units and mathematical models that were derived from mass transfer theory, laboratory measurements, and field evaluations. A detailed description of the models and comparisons of the model predictions to field measurements are given in the December 1987 TSDF air emission models document. The model units used in the emission models were derived from statistical summaries of design and operating parameters of units typically found at hazardous waste facilities. For a given type of process, the emission estimates for the different model units were combined to develop an average estimate.

Separate factors were derived for benzene dissolved in other organics and for benzene dissolved in water to reflect the effect on the volatility of benzene. Because of benzene's low solubility in water and high vapor pressure, benzene is highly volatile in wastewater or aqueous wastes. However, when benzene is dissolved in a mixture of similar organic compounds, it exhibits a lower volatility than in aqueous wastes (when compared at the same concentration). This distinction is not important for wastes processed in open area sources with a relatively long retention time because a high percentage of the benzene will volatilize, regardless of whether it is in an organic waste or aqueous waste.

The process information from the data sources indicated that the wastes are usually managed in a series of individual units. For example, a typical series could include a storage unit, treatment unit, and final disposal. A total of 58 processing sequences composed of one or more of the individual units was identified from EPA's data base. The fractions emitted for the individual units were combined to reflect an overall fraction emitted for each sequence of units. For example, a processing sequence composed of two individual units, both with a fraction

emitted of 0.5, would yield an overall fraction emitted of 0.75, indicating that 75 percent of the total benzene in the waste would be emitted.

Benzene emissions were estimated for each reported waste stream in the data base by multiplying the waste quantity times the benzene concentration times the fraction emitted for the given process sequence. The estimate for each waste stream was then summed for each facility to provide an estimate of the facility's emissions from benzene waste operations.

c. Uncertainties. There are several sources of uncertainty in the benzene emission estimates. One source of uncertainty is the waste benzene concentrations used in the computation of emissions. Actual measurements of benzene concentration in the wastes were available only for the effluent guidelines data and for a portion of the ISDB. The majority of the benzene concentration data provided by facilities was reported as being within a range of concentrations (e.g., 1 to 10 ppm, 10 to 100 ppm, etc.). For this analysis, the midpoint of the range was used to estimate emissions. If the actual concentration is typically at the upper or lower end of the range, actual emissions could be higher or lower than the estimates. Similarly, for the 25 percent of the waste quantity for which average concentrations were used, actual emissions from a waste stream could be higher or lower than the estimate to the extent that the actual benzene concentration is higher or lower than the average value used. The use of average and midrange values for benzene concentration should not introduce significant errors in estimates of total nationwide emissions.

Even where reported benzene concentrations were based on measured values, there is also potential for error. This potential error relates to the sampling point and the loss of benzene during sampling and analysis. For highly volatile compounds such as benzene, the total recovery after sampling and analysis is likely to be less than 100 percent because of losses during sample handling, storage, or analysis. The sampling point is important because not all of the concentrations were reported for the point of generation. If the reported concentrations were for the waste after transport, storage, or mixture with other wastes, then benzene losses from volatilization are likely, and the actual concentration would be higher than the reported value. An example is the effluent guidelines data, which often provided EPA source test measurements for mixed waste waters

in an equalization basin. Some of the individual benzene-containing streams may have been collected in sumps, transported in sewers, or processed in an oil/water separator prior to entering the equalization basin. Consequently, the reported concentrations would not reflect benzene losses prior to the sampling point. The net effect of loss of benzene during processing before the sampling point or during sampling and analysis is an underestimate of benzene emission. There were insufficient data on sampling locations, individual waste stream, and other specifics about the system to correct for this potential underestimate.

Another source of uncertainty in estimating benzene emissions from wastes is the waste quantities used. The information on waste quantity was generally provided by each facility. If this quantity was based on detailed historical records and was reported accurately, significant errors may not be introduced. However, investigation of some of the survey responses has shown that the facilities did not report all of their waste streams, and there is no assurance that the quantity of all benzene-containing waste was reported for each facility. Some facilities failed to report wastewaters and other hazardous wastes that are processed in units that have been exempted from RCRA permitting requirements, even though the information was specifically requested in the Generator Survey. The overall effect of incomplete reporting of waste streams is a likely underestimate of benzene emissions. There was no attempt made in the analysis to account for this potential underestimate because adequate data on unreported wastes were not available.

The estimates of fraction emitted are a significant source of uncertainty in the emission estimates for specific facilities. The values in this analysis are average or typical values; however, the actual fraction emitted for a given type of unit may be higher or lower than the typical value used. Many site-specific factors in the unit's design and operation (such as retention time, surface area, whether open or covered, quiescent or aerated) may result in actual emissions that are higher or lower than the estimates. The estimated effect of biodegradation is included as a competing removal mechanism in the estimates for wastewater treatment, impoundments, and land treatment. The only other removal mechanism included in the modeling is removal with the effluent in flowthrough units. To the extent that benzene is removed significantly during treatment by some other mechanism or

unknown process, emissions may be overestimated. Detailed site-specific design and operation information was not available for improved emission estimates.

Additional errors are introduced when the individual units are combined to form a processing sequence. The ISDB and the Generator Survey provided the most complete information on the sequence of units. However, assumptions were required to estimate the fraction emitted for several sequences. For example, the facilities did not generally report the individual streams that might be generated when the waste is dewatered or when it enters an oil/water separator. For dewatering and oil/water separators, assumptions were required for the quantity of wastewater and the quantity of sludge or oil that was produced. Another assumption made for the processing sequences was that solidification generally precedes disposal in a landfill or waste pile. For plants in the 1986 TSDR Survey, the general types of process units were identified but the actual sequence of units was not given. An assumption was made that the sequence is generally storage (in tanks or containers), followed by treatment (e.g., wastewater treatment), followed by disposal (land treatment, landfill). The potential errors introduced by the processing sequences may result in either over or underestimates of emissions.

Other uncertainties are introduced in the assumed level of control already in place. The estimates of baseline emissions assume that emission control devices are not used on tanks and other sources, that containers and tank trucks are splash-filled, and that wastewater treatment tanks, impoundments, landfills, waste piles, and land treatment facilities are open area sources that are not covered. In addition, organic liquids are assumed to be handled in covered tanks while aqueous wastes are assumed to be handled in a mixture of open and covered tanks. If emissions from these sources are controlled more than the assumed status, emissions are likely to be lower than estimated. However, the baseline level of control used in this analysis is expected to be reasonable based on available data.

In summary, the cumulative effect of these uncertainties is that the actual emissions from a specific facility may be higher or lower than what is estimated from the data base. Considering all of the uncertainties in the analysis, several factors suggest that total nationwide emissions may be underestimated.

These factors include: (1) Not all benzene waste streams were reported for each facility, (2) all facilities with benzene in their waste were not included, and (3) benzene losses may have occurred prior to or during sampling and analysis, causing measured benzene concentrations in wastes to be lower than actual. To improve the estimates, more detailed and complete information would be needed for all wastes containing benzene and for the units used to store, treat, or dispose of these wastes. However, the benzene data base encompasses the facilities and wastes likely to account for the majority of potential benzene emissions from waste operations.

3. Control Techniques

Several types of controls and control combinations can be applied to benzene waste operations. In general, air emission control systems can be based on (1) covers or enclosures that suppress or contain emissions such as fixed roofs, floating roofs, and floating membranes, (2) covers or enclosures with closed vent systems and control devices such as carbon adsorbers or vapor incinerators, (3) treatment processes to remove organics, (4) waste incineration, and (5) other techniques such as process modifications. These control techniques are discussed below.

a. Covers or Enclosures. Covers or enclosures reduce organic air emissions by suppressing the generation and loss of vapors containing the organics. Types of covers include fixed roofs, internal floating roofs and external floating roofs for tanks, covers for containers, and floating synthetic membranes for surface impoundments. Types of enclosures include air-supported or rigid enclosures for surface impoundments and container treatment or storage. Fixed roofs are applicable to open quiescent storage or treatment tanks and achieve emission reductions of 86 to 99 percent for open sources, depending on the volatility and concentration of benzene in the waste. Fixed roofs also may be used on open tanks that are mixed or aerated. For these sources, dome-shaped roofs may be used to allow room for the operation of surface-mounted aerators or agitators. Additional information on the efficiencies of fixed roofs for open storage or treatment tanks is included in Docket A-89-06, Item II-A-4.

External floating roofs are rigid covers that float on top of the waste in a tank and have a flexible seal along the periphery to control volatilization of organics from the space between the roof deck and the tank wall. These roofs

are widely used in the petroleum industry on tanks containing volatile organic liquids. In waste management operations, they are applicable to quiescent storage or treatment tanks and are capable of reducing emissions by 93 to 97 percent relative to open tanks. External floating roofs may not be appropriate for tanks storing certain corrosive or solvent wastes because of potential incompatibilities between the waste and the roof seal.

Internal floating roofs are similar to external floating roofs except that internal floating roofs are used in conjunction with a fixed roof. These roofs can be applied to tanks that already have a fixed roof or can be applied along with a fixed roof to uncovered tanks. The control efficiency of internal floating roofs used in conjunction with fixed roofs is estimated to range from about 93 to 97 percent relative to fixed roof tanks. As with external floating roofs, internal floating roofs may not be applicable to tanks containing certain corrosive or solvent wastes.

Covers are also effective means of reducing emissions from containers, such as drums or dumpsters, that are used in waste management operations. Container covers are devices that fit snugly over the top of the unit to contain organic vapors and prevent their release to the atmosphere. Air emissions can be reduced or eliminated by keeping the cover closed at all times during waste storage and handling, except when waste is being added to or removed from the container.

A floating synthetic membrane is a large sheet of synthetic material that can be used as a cover for certain waste management units such as quiescent surface impoundments. These covers may float directly on the liquid waste surface or may be supported above the waste by a system of pontoons. The control efficiency of these covers is a function of the fraction of surface area covered, the permeability of the membrane material, and the operating practices used. A control efficiency of 85 percent or greater is estimated for a range of applications that include impoundments of various configurations.

b. Closed Vent Systems and Control Devices. Covers or enclosures may be used in combination with closed vent systems that transport emissions to a control device. Closed vent systems and control devices are applicable to open tanks, surface impoundments, treatment processes, individual drain systems, and oil-water separators. Control devices may include gas-phase carbon adsorption, vapor incineration (thermal

or catalytic), flares, or condensers. Gas-phase carbon adsorption is widely used to control emissions of organics. Carbon adsorption systems can be designed to achieve a high removal efficiency by taking into account the organic constituents, the humidity conditions of the gas stream. Well-designed and operated gas-phase carbon adsorption systems can consistently remove at least 95 percent of many organics, including benzene, from an emission stream. This estimate of control efficiency assumes that if the carbon is regenerated, the emissions from condenser vents associated with the regeneration process are controlled.

But thermal and catalytic vapor incineration also are widely used for organic vapor destruction in industrial settings. Thermal vapor incineration is achieved by using a proper combination of temperature, residence time, and turbulence to convert combustible material to carbon dioxide and water. Catalytic vapor incineration uses a metal or alloy-based catalyst to promote combustion reactions at temperatures lower than those required for thermal oxidation. Properly designed and operated thermal and catalytic incinerators can achieve destruction efficiencies of at least 98 percent, although both may require auxiliary fuel to maintain stable flame conditions if used on a stream with a variable or low organic content.

Flares may also be used to control benzene air emissions. Steam or air-assisted flares have been shown to achieve combustion efficiencies of at least 98 percent on organic vapors having a heat content greater than 11.2 Megajoules per cubic meter at standard conditions [MJ/scm], which is equivalent to 300 British thermal units per cubic feet at standard conditions (Btu/scf) when designed according to the requirements of 40 CFR 60.18. Nonassisted flares burning gases with heat contents of 7.45 MJ/scm (200 Btu/scf) or more also can achieve combustion efficiencies of at least 98 percent.

Control of benzene air emissions may also be obtained using condensers. Condensers convert gas or vapor to liquid form by lowering its temperature or increasing its pressure. Condensation may be carried out in either contact condensers or surface condensers. Contact condensers are unlikely to be used in waste management operations because the resultant stream would create additional residues for treatment and disposal. Surface condensers most often consist of a shell and tube heat exchanger where the gas stream flows

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into a cylindrical shell and condenses on the outer surface of tubes that are chilled by a coolant flowing inside the tubes. While condensation is effective for use on gas streams with a high concentration of low volatility organics, it is not as effective for gas streams containing either very low organic concentrations or high volatility organics. Well-designed condensers used to control appropriate organic air emissions streams will achieve control efficiencies in excess of 95 percent.

c. *Treatment Processes to Remove Organics.* Organic removal processes such as steam stripping and TFE can be used to eliminate volatile components such as benzene from the waste stream before the volatiles are released from the subsequent waste treatment processes. Steam stripping involves the fractional distillation of volatile constituents from a less volatile waste stream. Removal efficiencies on the order of 95 to 100 percent are achievable for volatile compounds in general, and removal efficiencies of 98 to 99 percent are expected for benzene. Both batch and continuous processes are well-demonstrated and are commonly used to remove organics from aqueous streams such as process wastewater. The products and residues from steam stripping include the condensed vapors (condensate), noncondensable gases, and the treated waste or effluent. The condensate usually is decanted to remove any separate organic layer from the aqueous layer with recycle of the aqueous condensate back to the feed stream. The separate organic layer may be placed in tanks or containers for recovery or reuse as product or fuel. Air emissions from these tanks or containers can be controlled as discussed above. The noncondensibles released through the condenser or decanter vent can be transported by a closed vent system to a control device. Other emission sources may include vents from storage, blending, or accumulation tanks prior to the unit; the tank controls discussed above also can be applied to these vessels.

In general, batch or continuous steam stripping processes may not be suitable for treatment of certain waste such as sludges. Sludges and slurries (i.e., mixtures of liquids and solids) can be treated by TFE processes. Also, TFE can be used for organic liquids and organic/aqueous (two-phase) mixtures. The TFE process is designed to promote heat transfer by spreading a thin-layer film of liquid or sludge on one side of a metallic surface while supplying heat to the other side. A mechanical agitator aids the transfer of heat to the material by

exposing a large surface area for the evaporation of volatile compounds and agitates the film to maintain the solids in suspension without fouling the heat transfer area. This organic removal process can achieve removal efficiencies for benzene comparable to those for steam stripping. An EPA pilot-scale test on TFE performance in removing organics from petroleum refinery wastes found that 98.4 to 99.99 percent of the volatiles were removed. Emission sources associated with TFE include the overhead condenser vent, vents on blending, storage, or accumulation tanks prior to the unit, and vents on storage tanks containing any recovered organics. Emissions from these vents can be controlled by the control systems discussed above for steam stripping.

d. *Waste Incineration.* Waste destruction is another means by which air emissions from waste can be reduced. A properly designed and operated waste incinerator (liquid injection, rotary kiln, fluidized bed, and multiple hearth), with additional afterburner and flue gas handling systems can achieve a destruction efficiency of 99.99 percent. Incineration of benzene-containing solids where benzene is a small fraction of the mixture may also require supplemental fuel.

e. *Other Control Techniques.* In addition to the techniques described above, work practices and process modifications can also reduce emissions. Submerged filling is a work practice that can reduce emissions during container loading. During loading of liquid waste into containers, if the fill pipe does not extend below the liquid surface or is not permanently attached to the bottom of the container, splashing can occur resulting in organic vapor generation and emissions to the atmosphere through the containers opening. Emissions are reduced substantially if the end of the fill pipe is submerged below the surface of the waste during loading. This control technique is applicable to loading of liquid wastes into containers and has been estimated to reduce emissions from waste loading operations by 65 percent relative to splash filling.

The EPA also has identified one type of process modification that could potentially reduce air emissions from the management of petroleum refinery wastes. Delayed coking is a process used in some petroleum refineries to recover useful products from the heavy ends of the raw petroleum. Coking is an alternative to land treatment or landfilling of petroleum refinery wastes. Air emissions are believed to be low

because the process is performed in a closed system. With the use of a closed system, volatiles driven off by the high heating temperatures used in the process can be controlled by recycling emissions back to the process or by venting emissions to a control device. Although no definitive data are available to permit a direct comparison of emissions, use of the delayed coking process for petroleum refinery waste is expected to reduce air emissions.

4. Estimates of Exposure and Risk

Benzene emissions from the 390 facilities identified in EPA's data base on waste operations are estimated at 5,300 Mg/yr. Emissions from these facilities were modeled using the HEM to estimate the benzene concentrations and population exposures within 50 km of the facilities. Detailed documentation of the analysis is included in Docket No. A-89-06, Item II-B-1. The baseline incidence was estimated at 0.3 cancer case/year with a baseline MIR of 8×10^{-3} . The majority of these incidences occur in the population exposed to risk levels of 1×10^{-6} or higher.

5. Basis for Proposed Standard

Decision on Acceptable Risk. The baseline MIR of 8×10^{-3} is above the benchmark and is considered unacceptable for benzene, a known human carcinogen. The EPA examined several alternatives in deciding what constitutes acceptable risks. Those alternatives and the risks are illustrated in Table D-1. After examining these different alternatives and the associated risk distributions, EPA decided that Alternative 1 represents a risk that is acceptable for benzene waste operations. Control to the level of Alternative 1 reduces the MIR to 1×10^{-4} , and fewer than 10 people are estimated to be exposed to 1×10^{-4} with an incidence of less than 0.0001 case. In addition, EPA estimated that the majority of the people (greater than 99.9 percent) exposed to benzene from this source category would be exposed to a risk level less than 1×10^{-6} . For those exposures exceeding 1×10^{-6} , the incidence is only 0.004 case/year in an estimated population of 90,000. The total cancer incidence remaining after control to the level of Alternative 1 is estimated to be 0.03 case/year and 80 percent of this incidence is associated with exposure at risk levels less than 1×10^{-6} . In estimating these risk levels, EPA has not found that colocation of facilities significantly affects the magnitude of the MIR.

TABLE D-1.—BENZENE WASTE OPERATIONS: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (Case/yr)	Incremental incidence reduction
Baseline.....	8×10^{-3}	0.3
1.....	1×10^{-4}	0.03	0.3
2.....	1×10^{-4}	0.01	0.01
3.....	1×10^{-4}	0.007	0.003
4.....	1×10^{-6}	0.002	0.005

Note: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

The EPA also considered the noncancer health effects associated with benzene exposures at levels comparable to an MIR level of 1×10^{-4} . Noncancer health effects have been associated with exposure to benzene, but the concentrations reported to produce such effects are at least two to three orders of magnitude above the exposures predicted for these sources. After considering all these factors, EPA judged the emission level associated with Alternative 1 to be acceptable.

Decision on Ample Margin of Safety. The EPA considered selecting a level of emissions more stringent than that associated with the acceptable risk to provide an ample margin of safety. To reduce the complexity of studying the costs and benefits of all different combinations of control options, EPA has defined a combination of technically feasible controls that could be applied to the waste streams containing benzene. Alternative control options were then defined based on the quantity and concentration of benzene in the waste generated or handled by facilities. The alternatives considered by EPA and impacts of each alternative are presented in Table D-2. For the first three alternatives presented, emission reductions would be achieved by applying the same controls to a large number of waste streams depending on the quantity and concentration of benzene in the waste. For each of the first three alternatives, any further emission reductions would require reductions in the quantity of waste and cannot be obtained by the application of additional controls. The fourth alternative cannot be achieved by the application of controls alone and would require reductions in the quantity of benzene waste. Therefore, no cost estimates were assessed for this alternative.

TABLE D-2.—BENZENE WASTE OPERATIONS: CONTROL OPTION IMPACTS

Alternative	Annual cost \$ MM/yr (1986)	Benzene emission reduction (Mg/yr)	Incremental emission reduction (Mg/yr)
Baseline.....
1.....	39	5,100	5,100
2.....	43	5,200	140
3.....	58	5,200	30
4.....	5,300	70

Regulatory Status: The analysis assumes that air emissions from benzene waste operations are not controlled under current regulations.

Comments:

Baseline: No rule. Baseline emissions are about 5,300 Mg/yr.

Alternative 1: Controls are applied if benzene quantity at a facility exceeds 10 Mg/yr and the concentration of an individual waste stream exceeds 10 ppm.

Alternative 2: Controls are applied if benzene quantity at a facility exceeds 2 Mg/yr and the concentration of an individual waste stream exceeds 10 ppm.

Alternative 3: Controls are applied if benzene quantity at a facility exceeds 0.2 Mg/yr and the concentration of an individual waste stream exceeds 0.5 ppm.

Alternative 4: Sets a benzene quantity and emission limit of 0.06 Mg/yr for a facility.

NOTE: Controls include steam stripping for wastewater, thin-film evaporation for sludges and incineration for organic liquids. Waste management units located ahead of the treatment process would include submerged fill and covers for containers and 95-percent control devices for tanks and other sources that are covered and vented.

In comparing Alternative 1 with Alternatives 2 and 3, EPA found that the alternatives provide essentially the same level of risk protection. Each alternative reflects a significant risk reduction in comparison to the baseline risks and the MIR remains at 1×10^{-4} . The number of people exposed to a risk level between 1×10^{-4} and 1×10^{-6} would be reduced from 90,000 under Alternative 1 to 20,000 under Alternative 2. Under both options, the vast majority of the exposed population (greater than 99.9 percent) would be at risk levels of less than 1×10^{-6} . The total nationwide incidence would be reduced from 0.03 case/year under Alternative 1 to 0.01 case/year under Alternative 2 or by an additional 0.02 case/year. Most (about 90 percent) of the additional reduction in incidence under Alternative 2 compared to Alternative 1 occurs in the population exposed to risks in the 1×10^{-6} range or lower. In addition, benzene exposures reported to produce noncancer health effects are at least two to three orders of magnitude above the exposure levels predicted under either alternative. Therefore, noncancer health effects do not enter into the decision.

Alternative 1 reduces benzene emissions by about 95 percent and application of further control achieves an additional 1 to 3 percent reduction.

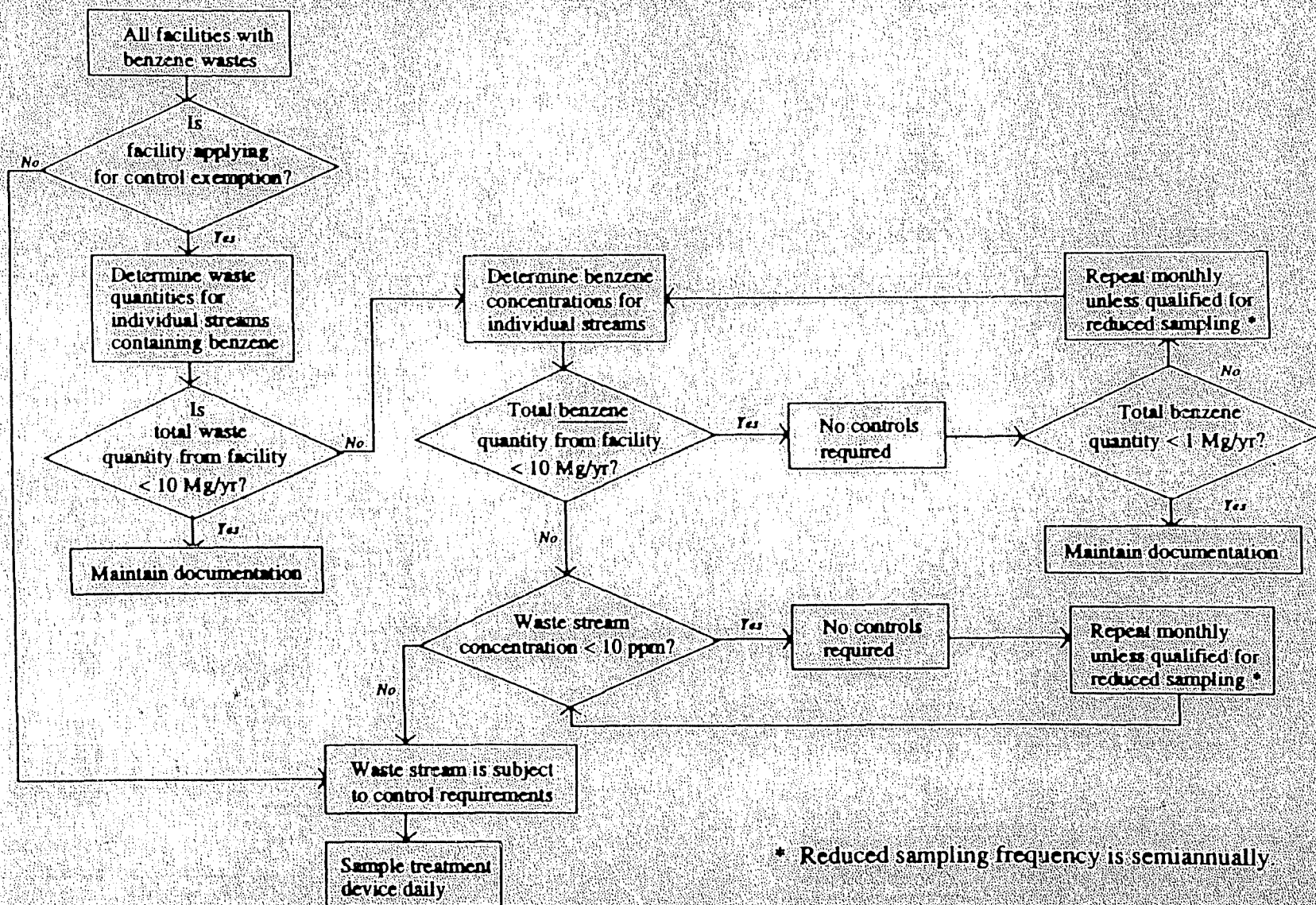
The additional control levels beyond Alternative 1 would increase the annual costs by about \$4 million and \$19 million per year, respectively.

In conclusion, EPA decided that the emission level of Alternative 1 will protect the public health with an ample margin of safety. The EPA judged the risk reductions of Alternative 1 and the additional control levels to be essentially the same. Moreover, while the additional cost of Alternatives 2 and 3 are relatively small, they are disproportionately large in comparison to the small emission and health reductions achieved.

Summary and Basis for Format of Standards. The proposed standard is applicable to all facilities that manage benzene wastes and requires waste treatment and air emission controls at those facilities that do not qualify for specific exemptions. The proposed regulatory approach is shown schematically in Figure D-1. As shown in the figure, the facility can apply for exemptions to the control requirements. If the facility produces less than 10 Mg/yr of total waste that contains benzene, then it would be exempt from the requirements of the proposed standards (except for maintaining documentation on the quantity of benzene waste) unless a process change occurs that increases the quantity of benzene waste. Alternatively, a facility may demonstrate that the total quantity of benzene in the waste is less than 10 Mg/yr and thereby be exempt from the proposed control requirements. This determination would be made through measurements of the benzene concentrations in the individual waste streams and calculating the total quantity of benzene from the facility. If a facility qualifies for this exemption, periodic measurements of the benzene concentration in the waste streams would be required. However, if the total benzene quantity is less than 1 Mg/yr, the facility would be required only to maintain documentation of the quantity of benzene in the waste, unless a process change occurs that increases the quantity of benzene in the waste. An additional exemption from the control requirements would be allowed if the initial measurements of the benzene concentrations in the individual waste streams are less than 10 ppm by weight. However, the facility must conduct periodic measurements of the benzene concentration to show that the waste stream continues to meet the concentration exemption.

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FIGURE D-1. BENZENE WASTE OPERATIONS



* Reduced sampling frequency is semiannually

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If the facility produces 10 Mg/yr of benzene or more in its waste and has an individual waste stream with more than 10 ppm of benzene by weight or if the facility elects not to apply for an exemption, the individual waste stream would have to meet certain control requirements. The proposed standard requires that benzene wastes be treated to reduce, remove, or destroy the benzene prior to managing the waste in units that are not controlled for air emissions. Treatment processes that are required by the proposed standards to remove benzene from wastes include steam stripping for wastewater and TFE for sludges. Treatment would be required to reduce the benzene concentration without the use of dilution. Alternatively, the waste may be incinerated with a demonstrated destruction efficiency of at least 99 percent. As an alternative to steam stripping, TFE, or waste incineration, the facility may demonstrate that some other treatment process achieves a 99-percent control efficiency for benzene emissions. For the alternative treatment process, 99 percent of the benzene in the waste must be either destroyed or recovered and reused.

Benzene emission controls would also be required for waste management units that handle the waste prior to treatment and would not be required on waste management units located downstream of the treatment process. Tanks, surface impoundments, containers used for treatment, individual drain systems, oil-water separators, and treatment processes would be required to be enclosed and vented to a vapor control device that achieves an efficiency of at least 95 percent. Covers would be required for containers used for storage and transport, and waste must be loaded into containers by submerged fill. Internal or external floating roofs would be acceptable alternatives for tanks if they meet the specifications required by the NSPS for Volatile Organic Liquid Storage Vessels (40 CFR part 60, subpart Kb). However, the size and vapor pressure cutoffs in Subpart Kb are not applicable and the controls for this proposed standard would be independent of the size of the tank or the vapor pressure of its contents. Floating roofs meeting the same specifications required by the NSPS for VOC Emissions from Petroleum Refinery Wastewater Systems (40 CFR part 60, Subpart QQQ) would also be an acceptable alternative for oil-water separators except for small portions of the separator where a floating roof is infeasible.

If the waste that contains benzene is shipped offsite for treatment or disposal, the offsite facility must be notified that the waste must be managed according to the requirements of the proposed standards, which includes treatment within 6 months after the waste is generated. As an alternative, EPA is also considering the need for a longer accumulation period, such as 1 year. Comments are solicited on the types of operations and wastes that would require accumulation, and on the maximum accumulation periods of 6 months and 1 year being analyzed by EPA.

The proposed standard requires that the performance of add-on vapor control devices and treatment processes be monitored. For treatment processes designed to remove or reduce the benzene content in the wastes, the benzene concentration at the outlet of the treatment process must be measured initially and daily thereafter to ensure that the device is operating as designed. As an alternative to measuring the benzene concentration daily, the facility may demonstrate and document that monitoring certain process parameters will ensure proper operation and acceptable performance. The EPA also is considering the use of continuous monitoring of a process or operational parameter(s) combined with a monthly benzene concentration measurement as an alternative to the proposed requirement for daily measurements. The EPA solicits comments on methods or approaches that would demonstrate the treatment process is being operated as designed to reduce benzene emissions.

Documentation of waste incinerators subject to and operated in compliance with 40 CFR part 264, Subpart O shall be sufficient to demonstrate compliance with this subpart. Waste incinerators that are not subject to or in compliance with 40 CFR part 264, Subpart O would be required to perform an initial performance test, measure the benzene concentration in the waste initially, identify a process parameter(s) for monitoring, and document the criteria for selection of that parameter and the range of acceptable values for the parameter. A monitoring device that continuously measures and records the values of the parameter(s) monitored for proper operation also is required.

Waste management units that are enclosed and vented to a vapor control device must be visually inspected (initially and quarterly thereafter) to ensure that no gaps or cracks occur in the enclosure or closed vent system and that all openings are closed and

gasketed properly. The enclosure and closed vent system must also be operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppm by volume above background during initial and quarterly inspections.

6. Impact of Proposed Standards

The proposed regulation would reduce baseline benzene emissions of 5,300 Mg/yr to 250 Mg/yr, a 95-percent reduction. Emissions of other volatile compounds present in the wastes would also be reduced; however, this reduction could not be quantified because of limited data on the other constituents and their concentrations. The estimated baseline incidence for leukemia from wastes containing benzene would be reduced from 0.3 to 0.03 case/year. The maximum risk would be reduced from 8×10^{-3} at the baseline to 1×10^{-4} by the proposed standard.

The total nationwide capital cost of the proposed regulation is estimated at \$65 million, primarily for steam stripping, TFE, waste incineration, and controls for tanks. The total annual cost is estimated at \$39 million per year. Approximately 70 (18-percent) of the 390 facilities in the benzene data base are estimated to be subject to this regulation and are expected to incur the majority of these costs.

7. Other Regulatory Requirements

In addition to the regulatory requirements being proposed today, waste streams containing benzene may be regulated by EPA under RCRA, as amended, other requirements under the CAA, the FWPCA, or the CERCLA, as amended. Following are brief discussions of the relationship between the requirements of existing or expected regulations under the above statutes and today's proposed standards.

a. RECA Requirements. Benzene is listed as a hazardous constituent in 40 CFR part 261, Appendix VIII of EPA's RCRA regulations, and has been identified as a component in several types of RCRA-listed hazardous wastes. Many of the 390 facilities identified as likely to be subject to today's proposal (and that were included in the data base used to estimate impacts for this proposed NESHAP) also are expected to be subject to hazardous waste management regulations developed under RCRA. However, several categories of facilities, such as small quantity generators and certain wastewater treatment units, are exempt from the RCRA permitting requirements. Today's proposed NESHAP for air emissions from benzene waste

operations would apply to sources subject to RCRA permitting requirements as well as those not subject to RCRA.

Regulatory requirements under RCRA that may have a direct or indirect impact on air emissions associated with benzene waste operations include: (1) the LDR being developed under section 3004(m); (2) air standards for hazardous waste TSDF's being developed under section 3004(n); (3) the Corrective Action program mandated by section 3004(u) and (4) existing standards under 40 CFR part 264 for the design and operation of hazardous waste incinerators.

Disposal Restrictions

Under the LDR (40 CFR parts 267 and 268), RCRA-listed hazardous wastes must be treated to reduce concentrations of specific constituents or hazardous properties before the waste may be placed in a land disposal unit (e.g., surface impoundment, waste pile, landfill, or land treatment operation). Treatment standards under the LDR are expressed as either concentration limits to which individual toxic constituents must be reduced or specific technologies by which a waste must be treated. Both the concentration limits and the technology specifications are established on the basis of treatment technologies identified as BDAT for each particular waste type. The EPA is proposing and promulgating the LDR in stages, with the final stage scheduled for promulgation in 1990. Additional information on LDR can be found in 51 FR 19300, May 28, 1986; 51 FR 40572, November 7, 1986; 52 FR 25760, July 8, 1987; 53 FR 11742, April 8, 1988; 53 FR 15000, May 17, 1988; 53 FR 31138, August 17, 1988; and 54 FR 1056, January 11, 1989.

Treatment standards have not been established for benzene as a spent solvent, as a component in waste commercial products and intermediates, or as an ignitable waste. Therefore, these benzene wastes are not currently affected by the LDR. However, treatment standards for certain wastes specific to the petroleum refining industry have been promulgated that include concentration limits for benzene in waste and wastewaters (53 FR 31138, August 17, 1988). For these waste streams, the limitation for benzene in nonwastewaters is 9.5 milligrams per kilogram (mg/kg) and for wastewater is 0.011 milligram per liter (mg/l). Although any nonprohibited technology can be used to meet these levels, these levels are based on the use of solvent extraction or fluidized bed incineration for nonwastewaters and waste incineration for wastewater residuals.

Air controls are not explicitly included for emissions released from treatment devices used to comply with the LDR. Today's proposed NESHAP would apply to many of the same waste streams that are controlled by the LDR. Because the benzene concentration limits imposed by the LDR are lower than those contained in today's proposal, treatment to comply with the LDR would also likely achieve compliance with today's proposed NESHAP. The focus of today's proposed standards would be to require treatment of wastes containing benzene and to control air releases from treatment devices. Today's proposal also would control benzene air emissions from some waste streams that are not regulated under the LDR and would require controls on waste operations that precede treatment of the waste stream.

Air Standards for Hazardous Waste TSDF's

Under the authority of RCRA, section 3004(n), EPA is currently developing standards for monitoring and control of organic air emissions from hazardous waste TSDF's. For that effort, EPA has developed a three-phased approach. Under Phases I and II, EPA is evaluating control of emissions of organics as a class, which would significantly reduce emissions of ozone precursors and air toxics. As part of Phase I, standards were proposed on February 5, 1987 (52 FR 3748) for air emissions from process vents on hazardous waste management units (including distillation, fractionation, thin-film evaporation, solvent extraction, air or steam stripping processes) and leaks in piping and associated equipment handling hazardous wastes. The EPA expects to promulgate regulations under Phase I in late 1989. In Phase II, EPA is evaluating controls of organic air emissions for other TSDF sources that are not covered by the Phase I activity or by other existing RCRA requirements. These sources may include surface impoundments, storage or treatment tanks, and containers. The EPA expects to propose standards for these sources in the Federal Register in late 1989.

In Phase III, EPA will evaluate the risk remaining after Phases I and II and, if needed, take further steps to reduce risk to levels within the range considered acceptable by EPA. These steps may include standards for individual toxic constituents or other approaches.

The requirements of today's proposed standards are expected to overlap with the air standards developed for hazardous waste TSDF's. Hazardous waste TSDF's that generate or handle

waste containing benzene will be required to meet certain aspects of today's proposed rule in addition to any existing or future requirements under RCRA. Therefore, long-range plans for control of TSDF's should consider future RCRA requirements in addition to the NESHAP requirements for benzene waste operations.

Corrective Action

Under the authority of RCRA, section 3004(u), EPA is developing rules to address releases of hazardous waste or hazardous constituents from SWMU's that pose a threat to human health and the environment. Because the corrective action program applies to contamination of soil, water, and air media, benzene air emissions may be addressed at some site-specific SWMU's. The corrective action standards under development would establish health-based trigger levels for ambient concentrations measured at the TSDF boundary to assess whether further remedial studies are required. Site-specific, health-based cleanup standards would then be set for air emissions that exceed health-based levels. When such exposure is determined, corrective action would be required to reduce emissions. Thus, benzene emissions released at a TSDF handling benzene waste may be subject to corrective action requirements. Corrective actions would be set for an individual facility and emissions would be controlled based on site-specific exposure concerns. In contrast, today's proposed NESHAP would be a nationwide standard applicable to all facilities that meet the applicability criteria and would impose uniform control requirements for all such facilities.

Incinerator Standards

Air standards for hazardous waste incinerators are currently included in 40 CFR part 264, subpart O. The rules for hazardous waste incinerators at facilities with final RCRA permits (40 CFR part 264, subpart O) require that incinerators be operated to achieve a destruction and removal efficiency of at least 99.99 percent for principal organic hazardous constituents listed in the facility's permit. Waste streams with benzene concentrations of 10 ppm or more would be subject to the NESHAP being proposed today. For those waste streams, documentation demonstrating compliance with subpart O would be sufficient to demonstrate compliance with today's proposed standards for treatment of the waste stream. Waste management units located upstream of the waste incinerator would be required

to install air emission controls under today's proposed requirements.

b. CAA Requirements. The standards for benzene waste operations are expected to overlap with other regulatory measures previously taken by EPA under the CAA. Under Section 111 of the CAA, EPA has established NSPS for Storage of Volatile Organic Liquids (40 CFR part 60, subpart Kb) and for VOC Emissions from Petroleum Refinery Wastewater Systems (40 CFR part 60, subpart QQQ). These NSPS apply only to new, modified, or reconstructed facilities. Today's proposed standards would apply to any new or existing facility generating or handling benzene waste, including those subject to the NSPS. Once the benzene waste quantity and concentration levels (10 Mg/yr and 10 ppm by weight) are exceeded, waste streams containing benzene would be required to meet the control requirements of today's standards. In the case of subpart Kb for storage, identical control requirements are specified in the proposed NESHAP for benzene waste operations. However, storage tank size and vapor pressure exemptions are not included for benzene waste operations. For benzene waste operations at or above the control requirement cutoffs (10 Mg/yr and 10 ppm by weight), controls would be required for any size of tank that contains benzene wastes. For the refinery wastewater system NSPS, more stringent control requirements are proposed for today's standards. Closed vent systems and control devices would be required for individual drain systems and oil-water separators.

The EPA also is currently developing a CTG document for VOC emissions from industrial wastewater facilities. These guidelines will be provided to States as recommendations for control of VOC emissions from industrial wastewater facilities in ozone nonattainment areas. The draft CTG for industrial wastewater is scheduled for publication in the *Federal Register* in late 1990. The preliminary recommendation in the draft CTG consists of steam stripping of the wastewater in the process area for removal of volatile organics. The recommendation for applicability cutoffs for controls had not been established at the time of this publication. It is likely that controls on waste streams containing benzene being proposed today will overlap with the CTG recommendations for industrial wastewater. Treatment of waste streams by steam stripping, TFE, or waste incineration proposed in today's standards would not necessarily

achieve the expected cutoff levels for volatile organics in the industrial wastewater CTG, due to the differences in volatilities of benzene and other organics in the waste stream. To comply with both this proposed standard and the draft CTG recommendation, the facility must evaluate the concentration of benzene and other organics.

c. FWPCA Requirements. Benzene also is subject to regulation as a priority pollutant contained in industrial wastewater discharges subject to the FWPCA. The EPA currently is developing new and revised effluent guidelines for direct dischargers (i.e., those that discharge directly into surface waters) and categorical pretreatment regulations for indirect dischargers (i.e., those facilities that discharge into a POTW and that are regulated by pretreatment requirements under the FWPCA to reduce pollutants entering POTW's). As part of this effort, effluent guidelines are under development for centralized hazardous waste treaters. Other industrial categories are continuing to be evaluated. Discharge requirements for benzene from the manufacture of organic chemicals, plastics, and synthetic fibers are now in effect for direct dischargers and take effect in November 1990 for indirect dischargers. The FWPCA requirements are expected to control discharges of benzene and other pollutants to surface waters and POTW's, while this NESHAP would control air releases of benzene from the waste. (Note: While the effluent guidelines and standards were based on the performance achieved by steam stripping, a closed system, dischargers are not obliged to use that technology to meet the discharge requirements.) From this standpoint, the proposed NESHAP for benzene waste is expected to complement the FWPCA requirements. The owner or operator of the facility may elect to use a single treatment device to comply with the requirements of the benzene waste NESHAP (provided it is steam stripping, TFE, waste incineration, or an approved alternative) and the effluent guidelines. However, air emission controls on the treatment device would be required by today's standards. In addition, any open device or unit located upstream of treatment would be required to be controlled. The owner or operator of the facility would have to assess the overall design of the treatment system to assure compliance with the requirements of today's standards and with the effluent guideline limitations.

d. CERCLA Requirements. Under the provisions of CERCLA as amended by

the Superfund Amendments and Reauthorization Act, EPA is authorized to undertake removal and remedial actions to clean up hazardous substance releases. Removal actions typically are immediate or expedited activities necessary to minimize exposure or danger to humans and the environment from the release of a hazardous substance. Remedial actions are longer term activities to permanently clean up hazardous substances and any soils, surface waters, or ground waters contaminated by the substances. Remedial and removal actions are required by CERCLA to comply with the requirements of Federal and State public health and environmental laws that are ARAR's for certain remedial and removal actions.

This proposed NESHAP is applicable to CERCLA sites if the benzene in the waste is 10 Mg/yr or more and the benzene concentration is 10 ppm or more. Although the control requirements being proposed under the NESHAP for benzene waste operations would not be applicable to benzene wastes that are below the cutoff levels (i.e., less than 10 Mg/yr and 10 ppm benzene), these controls may be considered "relevant and appropriate" at a specific CERCLA site. Therefore, it may be appropriate to apply these requirements to a remedial or removal action performed at a CERCLA site.

8. Request for Comments

The EPA solicits information on the following aspects of today's proposed regulation for benzene waste operations. In estimating benzene emissions from waste operations, EPA has relied on several existing information sources. The EPA requests comments on the estimation procedures and any actual quantifications of benzene emissions from waste operations. Additionally, EPA would be interested in quantification of total VOC from waste facilities.

The EPA believes that in most cases wastes would be treated within a short period of time after generation. However, because there may be some operations (e.g., batch operations) where it is necessary to accumulate sufficient quantities of waste before treatment, the proposed regulation would allow a 6-month period for accumulation of such waste. Wastes being accumulated for treatment, however, would be required to meet the proposed requirements for storage or accumulation units. As an alternative, EPA is also considering the need for a longer accumulation period, such as 1 year. Comments are solicited on the types of operations and wastes that would require accumulation and the

maximum accumulation periods being analyzed by EPA.

The EPA has developed four alternatives for the control of emissions from benzene waste operations. The EPA solicits comments on other control alternatives that may be available, their costs, and the expected emission reductions. The EPA also is considering the use of continuous monitoring of a process or operational parameter(s) combined with a monthly benzene concentration measurement as an alternative to the proposed requirement for daily measurements of the benzene concentration in the waste exiting the treatment process. The EPA is specifically interested in methods or approaches that would demonstrate the treatment process is being operated as designed to reduce benzene emissions.

E. Gasoline Marketing System

1. Source Category Overview

The term "gasoline marketing system" refers to the storage and transfer of gasoline as it moves from the bulk terminal to the service station gasoline storage tank. The major emission source categories in this system are bulk gasoline terminals, bulk gasoline plants, service stations, and delivery tank trucks.

Gasoline is normally delivered from the petroleum refinery to the terminal by way of pipeline, ship, or barge. For the terminal, large delivery tank trucks (30,000 to 36,000 liters, or 8,000 to 9,500 gallons capacity) normally deliver the gasoline to service stations or intermediate storage and handling facilities known as bulk plants. Bulk plants, using smaller delivery tank trucks (5,500 to 11,000 liters, or 1,500 to 3,000 gallons capacity), primarily supply service stations that are long distances from terminals or unable to accommodate the large terminal delivery tank trucks, and small accounts such as farms. At service stations, gasoline is transferred to storage tanks and ultimately to motor vehicles.

It is estimated that there are about 1,500 bulk gasoline terminals. A typical existing bulk gasoline terminal has: a daily throughput of about 950,000 liters (250,000 gallons); four floating roof gasoline storage tanks with a total capacity of 150,000 barrels; three tank truck loading racks with three bottom loading arms per rack; and six delivery tank trucks.

There are two major benzene emission points at a typical bulk gasoline terminal: the loading of gasoline into tank trucks and evaporation of gasoline from storage tanks. Benzene emissions during tank

truck loading at an uncontrolled facility are due to the displacement of vapors in the delivery tank to the atmosphere through the hatches. Benzene emissions from tank truck loading operations are estimated at 1,600 kg/yr (3,500 lbs/yr) for a typical uncontrolled bulk gasoline terminal as described above. Benzene emissions from storage tanks at this typical uncontrolled terminal are estimated at 140 kg/yr (310 lbs/yr).

It is estimated that there are about 15,000 bulk plants in the U.S. that distribute gasoline. The typical existing bulk plant has a daily throughput of about 25,000 liters (6,500 gallons); three fixed-roof storage tanks of 38,000 to 76,000 liters (10,000 to 20,000 gallons capacity each; one delivery tank loading rack with three submerged loading arms; and two delivery tank trucks.

There are two major emission sources in bulk plants: loading of delivery tank trucks and storage tanks. During loading of delivery tank trucks, benzene emissions are caused by the displacement of gasoline vapors in the delivery tank to the atmosphere by the incoming gasoline.

Benzene emissions from storage tanks are caused by filling, emptying, and breathing losses. Filling losses occur due to the displacement of gasoline vapors when a storage tank is filled with gasoline. Emptying losses occur when gasoline is pumped out of the storage tank, and fresh air is pulled into the tank. This fresh air gradually becomes saturated with gasoline vapors, expands, and this increase in volume is emitted to the atmosphere. Breathing losses are the result of normal expansion of vapors due to temperature changes during the day.

For a typical bulk plant, such as that described above, the overall annual benzene emission rate from storage tanks is estimated at about 80 kg/yr and from delivery tank truck loading operations about 50 kg/yr.

Service stations are facilities which engage in the refueling of motor vehicles. There are about 390,000 service stations in the U.S., of which some 180,000 are public outlets. A typical retail service station has a throughput of about 190,000 liters (50,000 gallons) of gasoline per month. It has about nine gasoline pump nozzles and three underground storage tanks of 38,000 liters (10,000 gallons) capacity each. Non-public stations tend to be considerably smaller.

Benzene emissions occur at service stations from the loading of underground storage tanks. The losses from the storage tanks are due to displacement of vapors by incoming gasoline. There are also emissions from storage tanks due to

emptying and breathing losses, but these are generally minimal. Benzene emissions from loading of storage tanks from the typical facility outlined above are estimated to be about 15 kg/yr (33 lbs/yr).

Benzene emissions also occur at service stations during the refueling of automobiles (Stage II). Controls for refueling emissions are being studied separately. On-board controls, typically carbon canisters used on automobiles to capture refueling emissions, have been proposed and some States have Stage II vapor recovery requirements at service stations.

There are two basic types of delivery tank trucks used for gasoline delivery: large truck-trailer transports and smaller account trucks. The delivery tank of truck-trailer transports ranges in total capacity from 30,000 to 36,000 liters (8,000 to 9,500 gallons) with one to six compartments for different grades of gasoline or other products. The delivery tank of account trucks is smaller with a total capacity of 5,500 to 11,000 liters (1,500 to 3,000 gallons) and one to six compartments. Each compartment on both truck-trailer and account trucks will typically have a hatch opening, dome cover, pressure-vacuum relief valves, and vents. Truck-trailer transports normally deliver gasoline from bulk terminals to service stations and bulk plants, while account trucks normally deliver gasoline from bulk plants to service stations. Because truck-trailer transports and account trucks usually vary only in size, no distinction is made between the two in the following discussion.

The major emission sources on delivery tanks are the hatch covers, and the pressure-vacuum relief valves or vents. A dome or hatch cover is used to seal the hatch opening during transport and during bottom loading and unloading operations. The seal around the dome cover and around the base ring where the cover attaches to the delivery tank shell are the most likely locations for leaks to occur when the dome cover is closed. These leaks can be caused by cracked or worn seals, warped or damaged hatch cover, and cracked or improperly installed dome cover base rings. Leaks can occur at the pressure-vacuum vents if they are not properly installed or maintained. The vent seal may become dirty or damaged, which would not allow a proper seal. There may be other emission sources. Improperly installed or damaged hose couplings can be emission sources. The delivery tank shell, if damaged, can produce emission sources from cracks or failures in welds. These types of leaks

occur less frequently than those discussed above, but may be large emission sources on some delivery tanks.

2. Basis for Emission Estimates

The nationwide annual emissions from this source category are estimated to be about 4,800 megagrams (1×10^7 lbs) per year of benzene. Baseline emissions are the emissions for gasoline marketing sources in some selected "base" year. The purpose of establishing an emission baseline is to be able to estimate the impacts of reducing emissions from this baseline through the implementation of additional control measures. The baseline emissions must take into account the level of control already in place in the base year to get an accurate assessment of the impacts of the control alternatives. The base year for the gasoline marketing source category was selected as 1987. This year was selected because this was the year for which the most recent gasoline consumption figures were available.

The general approach for establishing the emission baseline was basically the same for each sector of the industry. Data were obtained on the level of control already used by the States, and emission factors were selected to represent this level control. Uncontrolled areas were defined and emission factors were selected to represent the type of loading or type of operations in those areas. Emissions were calculated by multiplying the emission factors by the corresponding throughput for the controlled and uncontrolled areas. Emission reduction estimates were based upon the same analysis procedures, but using emission factors that represent controlled facilities. The methodology used for these emission estimates, as well as cost and health risk estimates discussed later, is described in detail in the following three EPA documents (see Section I for document number, etc.): "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry"; "Draft Regulatory Impact Analysis: Proposed Refueling Emission Regulations for Gasoline-Fueled Motor Vehicles—Volume I, Analysis of Gasoline Marketing Regulatory Strategies"; and "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industry—Response to Public Comments" (See Docket No. A-89-07, Category II-A). Although EPA used the same calculation methodology discussed in the above documents, key assumptions were reinvestigated and some were changed to better represent current conditions (e.g., gasoline consumption). These changes are

discussed in detail in Docket Item II-B-1 of Docket A-89-07.

Benzene emissions were calculated as a ratio to VOC emissions. Benzene is a naturally occurring constituent of gasoline. Benzene content in gasoline is variable and can be changed during the blending process at a refinery. An analysis of the 1987-1988 gasoline pools, based on information contained in reports by the National Institute for Petroleum and Energy Research, showed that the benzene content in the liquid gasoline varied from 0.06 percent to 6.2 percent by volume and averaged 1.47 percent by volume. Using vapor pressure calculations, a ratio of 0.62 percent was calculated to represent the benzene to VOC ratio in the vapors emitted from the gasoline marketing sources being studied.

3. Control Techniques

As part of their control plans for VOC emissions, certain States already require vapor balance control systems for approximately half of the existing bulk plants and service station storage tanks. Controls for VOC reduce all organic compound emissions, including benzene. Loading operations at about 70 percent of existing bulk terminals are controlled through State regulations for VOC, and at all new bulk terminals (constructed after December 17, 1980) by the NSPS for VOC, 40 CFR Part 60, Subpart XX. There are also State regulations for existing terminals and an NSPS for new bulk terminals for storage tank emissions, 40 CFR Part 60, Subparts K, Ka, and Kb.

Emissions resulting from outgoing transfer operations at bulk terminals are controlled by two main elements, a vapor processing system (or vapor processor) in conjunction with a vapor collection system. The vapor collection system consists of all the piping and components necessary to safely transfer the air-vapor mixture from the loading rack and tank truck to a vapor processor. There are currently four major types of vapor processors commonly used at bulk terminals: carbon adsorbers, thermal oxidizers, flares, and refrigeration systems.

The carbon adsorption vapor recovery system uses beds of activated carbon to remove gasoline vapors from the air-vapor mixture. These units generally consist of two vertically positioned carbon beds and a carbon regeneration system. During gasoline tank truck loading activity, one carbon bed is being used for adsorption while the other bed is being regenerated.

Thermal oxidation units are used to control emissions from bulk terminals without recovering any gasoline. The

gasoline vapor-air mixture generated from transfer operations at the loading rack can be piped to either a vapor holder or directly to the oxidizer unit. The vapor holder stores the air-vapor mixture from the loading rack so that the system can process gasoline vapors at a relatively constant concentration and flow. Once ignition has been initiated in the thermal oxidizer, the air-vapor mixture serves as the fuel and the combustion process continues until all of the vapors have been burned.

Flare operations are very similar to the operation of thermal oxidizer units. Also, flares, once ignited, do not use additional fuel for combustion. Current flares can be open or enclosed (shielded) and may be air assisted.

Refrigeration type recovery units recover gasoline vapors from the loading operation in the form of a liquid product. In the refrigeration system, the air-vapor mixture from the loading racks is routed to a condensation chamber and passed over a series of cooling coils. Temperatures in the condensation section can be as low as -84°C (-120°F). The gasoline vapors condense, with some water vapor in the air, and are separated in a gasoline/water separator.

These four vapor processing techniques have been reviewed extensively by EPA. The test data indicated that all four of these technologies could reduce VOC emissions to at least 35 mg per liter of gasoline loaded (or about 97 percent). In some instances, these technologies have been able to achieve 98 percent control or better.

Several other technologies exist and have been used for many years at terminals. These include compression-refrigeration-absorption, compression-refrigeration-condensation, and lean oil absorption systems. These technologies were considered adequate technology to meet the CTG requirements for bulk terminals and have been shown to reduce emissions to 80 mg/l.

Internal floating roofs can be used directly as a control device for existing fixed-roof tanks at terminals. An internal floating roof, regardless of design, reduces the area of exposed liquid surface in the tank. Reducing the area of exposed liquid surface, in turn, decreases the evaporative losses. The largest emission reduction is achieved by the presence of the floating roof vapor barrier that precludes direct contact between a large portion of the liquid surface and the atmosphere. All internal floating roofs share this design benefit. The relative effectiveness of one internal floating roof design over

another, is a function of how well the floating roof can be sealed.

From an emissions standpoint, the most basic internal floating-roof design is the noncontact, bolted, aluminum, internal floating roof with a single vapor-mounted wiper seal. The four types of emission sources from this roof design are losses from around the roof rim or seal, from around fittings on the floating roof, from deck seams, and as a result of product withdrawal. Rim or seal losses and fitting losses constitute the largest percentage contribution to the total loss from an internal floating roof tank. Depending on the type of roof and seal system selected, installing an internal floating roof in a fixed-roof tank will reduce the total emissions by 68.5 to 97.8 percent.

External floating-roof tanks do not experience the fitting losses or deck seam losses that occur with most internal floating-roof tanks. The external floating-roof tanks are constructed almost exclusively of welded steel. This accounts for the absence of the deck seam losses. Further, because of the roof design, few if any deck penetrations are necessary to accommodate fittings.

Rim seal losses and withdrawal losses do occur with external floating-roof tanks. The only difference between external floating-roof tanks and internal floating roofs is that the external floating-roof seal losses are believed to be dominated by wind induced mechanisms. A secondary seal, in conjunction with a primary seal, provides an additional level of control. Withdrawal losses in external floating-roof tanks, as with internal floating-roof tanks, are entirely a function of the turnover rate and inherent tank shell characteristics. No control measures have been identified that are applicable to withdrawal losses from floating-roof tanks.

Control of gasoline working and breathing losses resulting from storage and handling of gasoline at bulk plants can be accomplished through submerged fill and a vapor balance system. Submerged fill is the introduction of liquid gasoline into the tank being filled with the transfer line outlet being below the liquid surface. Submerged filling minimizes droplet entrainment, evaporation, and turbulence. This is compared to splash loading where the transfer line outlet is at the top of the tank. Submerged filling of tank trucks can reduce vapor loss by 58 percent when compared to splash loading.

The vapor balance system consists of a pipeline between the vapor spaces of the truck and the storage tanks which essentially creates a closed system allowing the vapor spaces of the storage

tank and the truck to balance with each other. The net effect of the system is to transfer vapor displaced by liquid in the storage tank into the transport truck during transfer of gasoline into the storage tank. This prevents the compression and expansion of vapor spaces which would otherwise occur in a filling operation. If a system is leak tight, very little or no air is drawn into the system, and venting, due to compression, is also substantially reduced. Also, vapor balancing of storage tanks and outgoing account trucks reduces account truck filling losses and virtually eliminates emptying losses from storage tanks (i.e., displaced vapors are returned to the storage tank in this closed balance system). The balance system has proven to be effective in bulk plant applications for both the delivery of gasoline by transport truck to the bulk plant and for loading account trucks. Based upon EPA test data reported in the CTG for bulk gasoline plants, controls on bulk plant storage tanks can reduce filling losses by greater than 95 percent, and draining and tank truck loading losses by greater than 90 percent.

Tank trucks become a separate source of emissions when leakage occurs during gasoline loading from the truck-mounted vapor collection systems and truck compartment dome covers. This leakage has been estimated to be as high as 100 percent of the vapors which should have been captured and to average about 30 percent. Vapor leakage can be minimized by the requirement of all tanks to pass an annual leak-tight test. To meet these annual requirements, maintenance of the vapor containing equipment such as the hatch cover seals and pressure-vacuum vents must be conducted, and repairs performed. The CTG for gasoline tank trucks recommends pressure limits for the annual test on the tanks and their vapor collection equipment. The CTG recommends that the tank trucks pass an annual certification test which verifies the vapor-tightness of the tank. Evaluation of test data for trucks having passed an annual leak-tight test indicated that the average leak rate was reduced to approximately 10 percent, meaning that, on the average, approximately 10 percent of the air-vapor mixture exhausted from a regulated gasoline tank truck during product loading would leak to the atmosphere without reaching the vapor processor. The leak rate can be reduced further by more frequent leak testing.

Emissions from underground tank filling operations at service stations can be reduced by the use of a vapor balance system (Stage I control). In the

service station balance system, vapors which would normally be vented to the atmosphere are routed back to the delivery truck which unloads gasoline through a vapor collection system. The truck transfers the vapors to the terminal or bulk plant for ultimate treatment by the vapor processors at the terminal.

Gasoline is loaded by gravity into the underground storage tanks via a flexible hose. Liquid gasoline displaces a nearly equal volume of partially saturated gasoline vapors. The vapor is vented through a pipe and flexible hose connected to a vapor collection system (i.e., a manifolded pipe) on the transport truck. Liquid transfer creates a slight pressure in the storage tanks and a slight vacuum in the truck compartment. These pressure differences effectively cause the transfer of displaced vapor to the truck. Because of a phenomenon known as vapor growth caused by liquid temperature differences, the truck volume cannot always accommodate all of the vapors. Any excess vapor is released through the vapor vent line. This technology has been demonstrated and installed in service stations for over 15 years. The EPA has also provided design guidance for Stage I controls as far back as 1975. Tests demonstrate balance systems to be greater than 95 percent efficient for reducing underground storage tank filling losses.

4. Estimates of Exposure and Risk

Analyses were conducted to estimate the exposure and risk associated with benzene emissions from bulk gasoline terminals, bulk gasoline plants, and storage vessels at service stations. Estimates were made for MIR, which is based on the maximum exposure and worst condition found in the analysis, and annual cancer incidences, which is based on average concentrations and conditions for individuals living in the vicinity of the facility.

The MIR analysis estimated the probability that an individual subject to high exposure levels throughout a 70-year lifetime would result in a cancer incidence. The ISC dispersion model was used to estimate individual and combined contributions to ambient concentrations at a number of receptor points from multiple emission sources. The ISC model calculated annual concentrations of benzene at receptors in the vicinity of a bulk terminal complex, a bulk plant complex, and a service station complex. The highest concentrations were used in the MIR analysis. The following paragraphs describe the methods used to calculate

40 CFR Subpart FF

Benzene Waste Operations NESHAP

Preamble Proposed Rule

September 14, 1989

54 FR 38083

Preamble

(Final Rule)

March 7, 1990

55 FR 8292

April 3, 1990

55 FR 12444

Correction

May 2, 1990

55 FR 18331

September 10, 1990

55 FR 37231

Proposed Rule/Stay of Effectiveness

December 9, 1991

56 FR 64217

Preamble, Final Stay

(Proposed and Final Rule)

March 5, 1992

57 FR 8012

Clarifying Amendments and Lawsuit

December 1, 1992

Preamble

(Final Rule)

January 7, 1993

58 FR 3095

RULE

(Most Recent Update)

40 CFR 61 Subpart FF

the MIR attributable to each of these three industry segments.

Terminals are typically clustered together in a location either at a point along a pipeline or river. In past analyses, a complex of terminals was used to estimate the lifetime risk from bulk terminals. However, the greatest contribution to risk impacts always came from the largest facility in the complex. Therefore, in the latest analysis, risk estimation is calculated in the vicinity of the largest model terminal (3,800,000 liters or 1,000,000 gallons per day). Emission points at this terminal consisted of six storage tanks, four loading racks, and a vapor processor. The layout for the terminal was based on the apparent centers of individual terminals at known bulk terminal locations in attainment areas, shown on a topographical map. The physical dimensions of each source (release height, location, initial dispersion parameters, etc.) represent the dimensions of typical sources within a bulk terminal.

The maximum concentration predicted was then used along with the benzene unit risk factor to calculate the MIR for benzene (both controlled and uncontrolled). The uncontrolled MIR calculated for benzene emissions from bulk terminals using this procedure was 5×10^{-5} .

The lifetime risk analysis for bulk plants used a hypothetical layout of a bulk plant complex as input to the ISC model. The configuration was selected to represent a typical complex of bulk plants, all located in one part of a metropolitan area. The bulk plants include each of the four model plant sizes with gasoline throughputs ranging from 11,000 liters/day (3,000 gallons/day) to 64,000 liters/day (17,000 gallons/day). (Each of the bulk plants in the complex was assumed to have one loading rack and three storage tanks for gasoline.) The physical dimensions of the sources within the complex were representative of typical sources within a bulk plant. The ISC model was executed to obtain predicted concentrations at an array of receptors. The model was also executed with four different sets of meteorological data representing various parts of the U.S. The maximum concentration always resulted from the same set of meteorological data. The maximum concentration predicted was then used along with the benzene unit risk factor to calculate the MIR for benzene (both controlled and uncontrolled). The uncontrolled MIR for benzene emissions using this methodology for bulk plants was 1×10^{-5} .

The methodology of the lifetime risk analysis for service stations used a

hypothetical layout of a service station complex as input to the ISC model. This complex configuration was developed to represent a grouping of service stations at an urban exit from an interstate highway. The complex was assumed to be comprised of eight service stations, which include at least one of each of the five model stations with gasoline throughputs ranging from 19,000 liters/month (5,000 gallons/month) to 700,000 liters/month (185,000 gallons/month). The entire complex was comprised of 14 refueling islands and 8 underground storage tank vents. The physical dimensions of the sources within the complex are representative of typical sources at service stations. The ISC model was executed with varying model plant-specific uncontrolled emission rates (based on baseline throughput). The model was also executed with three different sets of meteorological data representing various parts of the U.S. The maximum concentrations again always resulted from the same set of meteorological data. The maximum concentration predicted was then used along with the unit risk factor to calculate the MIR for benzene. Using this methodology, a MIR for benzene emissions from service stations underground tanks was estimated as 5×10^{-6} .

In order to calculate nationwide community exposure to emissions (and the resultant cancer incidences) from bulk terminals and plants, assumptions were made concerning their geographical distribution. The fundamental assumption was that facilities were located in proportion to the gasoline throughput for an area—for example, the largest model plants would be located in large urban areas where throughput (and population density) were highest. Further, each model plant size in each source category (bulk terminals and bulk plants) was distributed over a range of 10 urban area sizes. The largest terminals, for instance, were assumed to be located in cities ranging in size from New York City to Des Moines, Iowa; the smallest terminals were assumed to be located in cities ranging in size from Spokane, Washington to Effingham, Illinois. Estimates were also made of the extent of existing control at these terminals. Most of the terminals in the large cities (likely to be ozone nonattainment areas) were considered controlled in accordance with existing regulations, with proportionally fewer facilities controlled in the smaller areas.

In a similar fashion, model service stations were allocated to 35 localities (multi-county metropolitan areas or single counties), grouped by seven

population size ranges. The model plants were selected to be representative of the total national service station distribution. The localities and seven population size ranges were selected to be representative of the total national population distribution.

Ambient concentrations, exposure, and cancer incidence associated with bulk terminals, bulk plants, and service stations were calculated using the HEM. The HEM is a model capable of estimating ambient concentrations and population exposure due to emissions from sources located at any specific point in the contiguous U.S. The results of this model indicated the following cancer incidence estimates associated with benzene emissions: bulk gasoline terminals—0.1 case/year; bulk gasoline plants—0.05 case/year; and service station storage tanks 0.1 case/year.

Tables E-1, E-2, and E-3 present the health risk information for the gasoline marketing system. Shown are baseline risks, and risks associated with different control alternatives for each source category. The control alternatives represent varying combinations and levels of control for emission points at the sources. Incidence was calculated by projecting model areas to national total. Meaningful risk distribution cannot be calculated. Thus, incidence for risk groups is also not provided.

TABLE E-1.—BULK GASOLINE TERMINALS: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/yr)	Incremental incidence reduction
Baseline	5×10^{-5}	0.1	
1	1×10^{-5}	0.09	0.01
2	1×10^{-5}	0.08	0.01
3	5×10^{-6}	0.08	0

Note: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

TABLE E-2.—BULK GASOLINE PLANTS: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/yr)	Incremental incidence reduction
Baseline	1×10^{-5}	0.05	
1	2×10^{-6}	0.02	0.03
2	1×10^{-6}	0.01	0.01

Note: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

TABLE E-3.—SERVICE STATIONS—STAGE 1: RISK INFORMATION

Alternative	Maximum individual lifetime risk	Incidence (case/yr)	Incremental incidence reduction
Baseline	5×10^{-6}	0.1	
1	2×10^{-6}	0.06	0.04
2	2×10^{-6}	0.05	0.01

Note: All risk estimates are rounded to one significant figure. Due to independent rounding, figures given in the table may not sum to the value given.

These decisions are based on benzene emissions from Stage 1 gasoline marketing operations. However, EPA has reported elsewhere preliminary health risk estimates for exposures to gasoline vapors as a whole (see "Draft Regulatory Impact Analysis: Proposed Refueling Emissions Regulations for Gasoline-fueled Vehicles—Volume I). Aside from the fact that benzene is the target pollutant here and that health impacts from exposure to gasoline vapors are a collateral issue, these estimates are not presented here because of uncertainty as to what they actually represent. In addition to the usual uncertainties associated with EPA's health risk estimates, other uncertainty arises in the case of gasoline vapors as a mixture because the unit risk estimate is based solely on limited animal data. Furthermore, a degree of controversy exists as to the method of exposure in the animal studies, and whether or not people would similarly be exposed to the cancer-causing constituents in gasoline vapors under normal conditions. In the animal studies, a sample of gasoline was entirely vaporized and the animals exposed to those vapors. The animals were thus exposed to the more complex hydrocarbon molecules ("heavy ends" compounds with greater than six carbon atoms per molecule) that would not ordinarily vaporize under conditions typical of human exposure. The EPA does not know at this time which fraction (heavy ends or light ends) of the gasoline vapors primarily contains the compounds that induced cancers in the animals. The EPA is still reviewing existing data and gathering data to help

resolve this issue. Because of these outstanding questions, EPA does not consider it appropriate to include such estimates in the analysis for these decisions. However, to the extent that gasoline vapors do present an additional human health problem, these standards will minimize that problem.

5. Basis for Proposed Standard

a. Bulk Gasoline Terminals.—
Decision on Acceptable Risk. As stated earlier, the baseline MIR is about 5×10^{-6} which is below the presumptive acceptable risk of approximately 1×10^{-5} . These risks are not expected to be significantly affected by the colocation of facilities. The baseline annual incidence is about 0.1 case/year. The EPA also considered the noncancer health effects associated with benzene exposure at levels comparable to an MIR level of 5×10^{-6} . Noncancer health effects have been associated with exposure to benzene, but levels of benzene exposure reported to produce noncancer health effects are at least two orders of magnitude above these exposure levels. After considering all these factors, EPA judged that the emission level at baseline represents an acceptable risk.

Decision on Ample Margin of Safety. The EPA considered selecting a level of emissions more stringent than the baseline level which was judged to represent an acceptable risk. Three levels of controls were evaluated. Alternative 1 represented the level of control presently required by CTC for control in ozone nonattainment areas (80 mg VOC/1 gasoline loaded). This level of control would require the installation of vapor collection and processing equipment to reduce tank truck loading emissions to 0.5 mg benzene/1 of gasoline loaded (equivalent to 80 mg/1 VOC with 0.6 percent benzene in vapors), the installation of internal floating roof controls or external floating roof controls with secondary seals for all gasoline storage vessels, and that all gasoline tank trucks loading at bulk terminal pass a vapor tightness test on an annual basis.

Alternative 2 represented the same level of control as Alternative 1, except that tank loading emissions would be reduced to 0.2 mg benzene/1 gasoline loaded. This level of control is consistent with NSPS requirements for new bulk terminals and storage vessels.

Alternative 3 represented the same level of control as Alternative 2 for storage vessels. However, emissions from tank truck loading would be reduced to 0.1 mg benzene/1 of gasoline loaded and all gasoline tank trucks loading at bulk gasoline terminals would have to pass a vapor tightness test on a semi-annual basis. This level represents a step beyond the NSPS level of control in an effort to further reduce benzene emissions from vapor processor outlets and tank truck leakage.

Table E-4 shows the estimated control costs and emission reductions achieved through application of these alternatives for bulk gasoline terminals. In comparing these alternatives, EPA considered the reductions in benzene risks, the control costs, the feasibility of achieving the control level of each alternative, and the cobenefits of control such as recovery of gasoline vapors that would be lost to the atmosphere, pollution prevention and any secondary control of urban air toxics. Based on these factors, EPA decided that the level of control reflected by Alternative 2 provides an ample margin of safety. Although the existing emission level and risks are considered acceptable, they can be reduced further at a reasonable cost considering all the benefits of control. The controls associated with Alternative 2 would reduce risks associated with benzene emissions from bulk terminals to 1×10^{-6} and 0.08 case/year. In addition, although EPA was not able to estimate the cancer incidence associated with various risk levels, the incidences for risk levels above 1×10^{-6} would be lower under Alternative 2 than baseline. Benzene concentrations reported to produce noncancer health effects are at least two to three orders of magnitude above the levels expected for baseline and all the control alternatives. Consequently, noncancer health effects did not enter into the decision.

TABLE E-4.—GASOLINE MARKETING: CONTROL OPTION IMPACTS

Sources and control options	Annual cost (\$MM/Yr. (1984))	Emissions reductions ^a (10^{-3} Mg/Yr)		Incremental emission reductions (10^{-3} Mg/Yr)	
		Benzene	VOC	Benzene	VOC
Bulk Gasoline Terminals:					
Baseline					
Alternative 1	51	0.9	140	0.9	140
Alternative 2	48	1.1	120	0.2	30
Alternative 3	120	1.2	190	0.1	20

TABLE E-4.—GASOLINE MARKETING CONTROL OPTION IMPACTS—Continued.

Sources and control options	Annual cost,*SMM/Yr (1984)	Emissions reductions,* (10 ⁻³ Mg/Yr)		Incremental emission reductions (10 ⁻³ Mg/Yr)	
		Benzene	VOC	Benzene	VOC
Bulk Gasoline Plants:					
Baseline					
Alternative 1	31	0.8	130	0.8	130
Alternative 2	35	0.8	130	0.0	0
Service Station Storage (Stage I):					
Baseline					
Alternative 1	20	1.2	190	1.2	190
Alternative 2	100	1.3	210	0.1	20

* SMM is millions of dollars. The dollar year is 1984.

* Over baseline.

The EPA concluded that additional control beyond Alternative 2 is not warranted. Alternative 3 provides essentially the same level of protection as Alternative 2. The cost of the additional controls of Alternative 3 is disproportionately high considering the small gains in health protection and cocontrol benefits, such as energy conservation.

In conclusion, the EPA decided that the emission level of Alternative 2 would protect the public health with an ample margin of safety. Therefore, EPA is proposing standards to limit emissions from bulk gasoline terminals as described below.

Summary and Basis for Format of Standard. The format for the standard for bulk gasoline terminals was based upon the existing NSPS requirements for bulk terminal loading racks and storage vessels, since the approach to the standard was to extend NSPS limits to all existing bulk terminals. The benzene emissions limits for bulk terminal loading racks was based upon the NSPS VOC emission rate and the ratio of benzene to VOC in the exhaust from the vapor processor. The benzene to VOC ratio, as discussed earlier, was based upon vapor pressure calculations, average benzene content in the gasoline pool, and source test information on the vapor processor efficiency for benzene. Storage tank and tank truck requirements were identical to those required in the NSPS.

The proposed standard would limit benzene emissions from the outlet of vapor processors to 0.2 mg benzene/l of gasoline loaded into gasoline tank trucks. Many existing vapor processors were installed to meet CTC levels of emission control and the costs were considered prohibitive to require the removal and replacement of these control devices before the end of their useful lives. Most of these existing devices were installed by the end of 1982 to meet State deadlines. Since the equipment was estimated to have a

useful life of 10 years, the proposed standard would require that all control devices, new and existing, must meet the 0.2 mg benzene/l standard no later than December 31, 1992.

The storage vessels requirements under this standard are identical to the requirements promulgated in subpart Kb of 40 CFR part 60. The tank truck requirements under this standard are identical to the requirements promulgated in subpart XX of 40 CFR part 60.

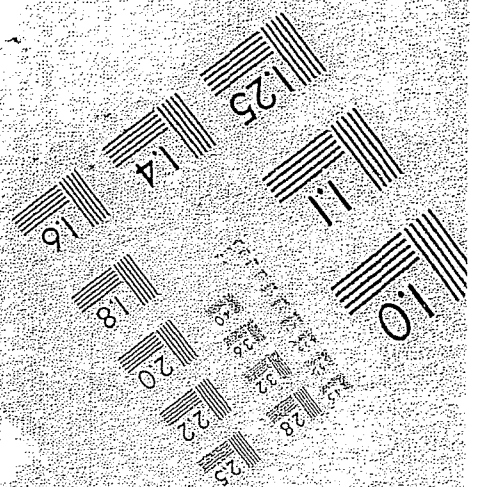
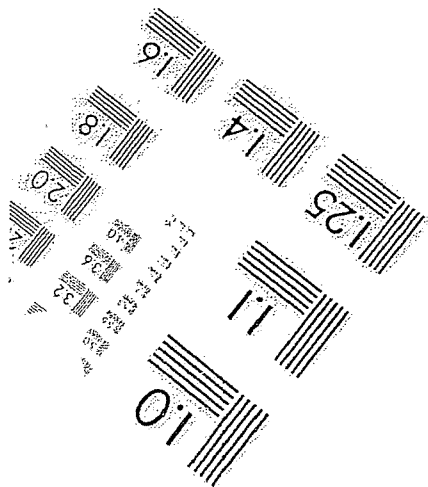
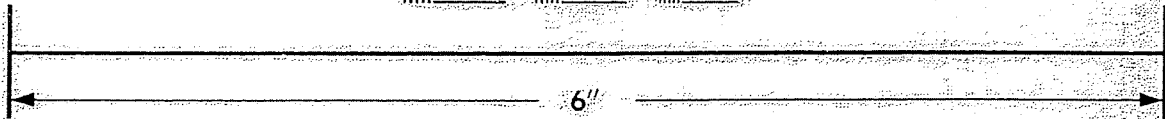
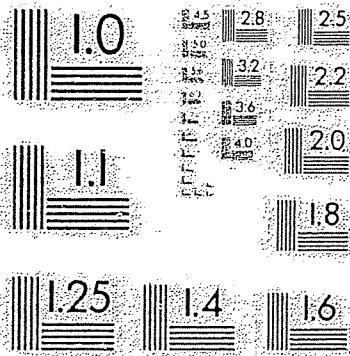
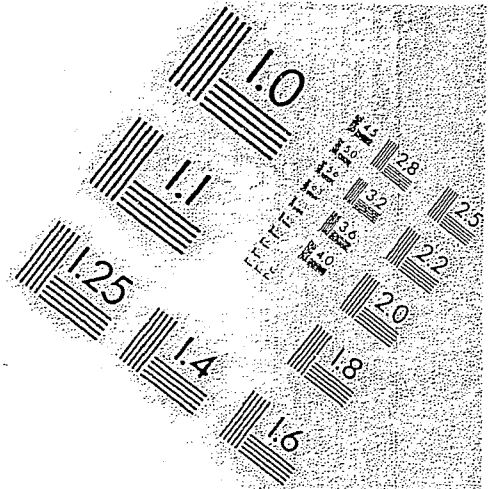
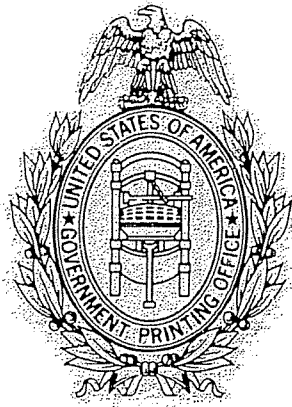
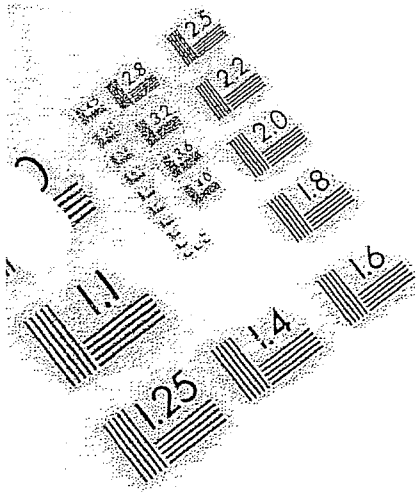
b. Bulk Gasoline Plants.—Decision on Acceptable Risk. As stated earlier, the baseline MIR is about 1×10^{-5} which is below the presumptive acceptable risk of approximately 1×10^{-4} . These risks are not expected to be significantly affected by the co-location of facilities. The baseline annual incidence is about 0.05 case/year. The EPA also considered the noncancer health effects associated with benzene exposure at levels comparable to an MIR level of 1×10^{-5} . Noncancer health effects have been associated with exposure to benzene, but levels of benzene exposure reported to produce noncancer health effects are at least two orders of magnitude above the exposures predicted for these sources. After considering all of these factors, the EPA judged that the emission level at baseline represents an acceptable risk.

Decision on Ample Margin of Safety. The EPA considered selecting a level of emissions more stringent than the baseline level which was judged to represent an acceptable risk. Alternative 1 represented extending nationwide the level of control presently recommended by CTC for control in ozone nonattainment areas. This alternative would require all bulk plants to install a vapor balance system between the tank truck delivering gasoline to the bulk plant and the bulk plant storage vessels. As stated earlier, EPA estimates that this system would reduce emissions by 95 percent. This alternative would also require bulk

plants with a gasoline throughput of greater than 4,500,000 liters per year (1,200,000 gallons per year) to install a vapor balance system between the bulk plant storage vessels and gasoline tank trucks loaded at the bulk plant loading racks. The EPA estimates that this system would reduce emissions by 90 percent. Tank trucks that will be connected to either vapor balance system would be required to pass an annual vapor-tightness test. For bulk plants with a gasoline throughput less than 4,500,000 liters per year, gasoline tank truck loading would be restricted to submerged fill only.

Alternative 2 represented the same level of control as Alternative 1, except that tank trucks that must connect to a vapor balance system would be required to pass the vapor-tightness test on a semi-annual basis. This additional restriction was considered to reduce tank truck leakage emissions and the associated benzene risk from the loading rack operations.

Table E-4 shows the estimated control costs and emission reductions achieved through applications of the alternatives for bulk gasoline plants. In comparing these two alternatives, EPA considered the reductions in benzene risks, the control costs, the feasibility of achieving the control level of each alternative, and the cobenefits of control such as energy conservation, pollution prevention and secondary control of urban air toxics. Based on these factors, EPA decided that the level of control reflected by Alternative 1 provides an ample margin of safety. Although the existing emission level and risks are considered acceptable, they can be reduced further at a reasonable cost considering all the benefits of control. The controls associated with Alternative 1 are estimated to reduce benzene risks to 2×10^{-6} and 0.02 case/year. In addition, although EPA was not able to estimate the cancer incidences associated with various risk levels, the incidences for



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risk levels above 1×10^{-6} would be lower under Alternative 2 than baseline. Benzene concentrations reported to produce noncancer health effects are at least two to three orders of magnitude above the levels expected for baseline and all the control alternatives. Consequently, noncancer health effects did not enter into the decision.

The EPA concluded that additional control beyond Alternative 1 is not warranted. Alternative 2 provides essentially the same level of protection as Alternative 1. The cost of the additional controls of Alternative 2 is disproportionately high considering the small gains in health protection and cocontrol benefits, such as energy conservation.

In conclusion, the EPA decided that the emission level of Alternative 1 would protect the public health with an ample margin of safety. Therefore, EPA is proposing standards to limit emissions from bulk gasoline plants as described below.

Summary and Basis for Format of Standard. The bulk gasoline plant standard would require the installation of vapor balance equipment to capture and transfer emissions between storage vessels and gasoline tank trucks. The format of the standard is, therefore, an equipment standard, rather than a mass emission or percent reduction standard. This format was selected as the basis for the standard since the testing of both inlet and outlet vapor balance systems was considered very difficult and costly.

The proposed standard would require all bulk plants to install a vapor balance system between the gasoline tank truck and the gasoline storage vessel to capture and control emissions that occur during storage vessel filling. The proposed standard would also require that all hose connections, pressure-vacuum valves, and gauge or sampling wells be vapor-tight during the gasoline transfer. It would be the bulk plant owner/operator's responsibility to ensure that the vapor return lines are attached during transfers and that the truck hatch covers are closed.

The proposed standard would require all bulk plants with an annual gasoline throughput of greater than or equal to 4,500,000 liters (1,200,000 gallons) to install a vapor balance system between the gasoline storage vessel and the gasoline tank truck to capture emissions from the loading of gasoline tank trucks. The vapor balance system would be required to be equipped with connections that are vapor-tight during transfer and seal upon disconnect to ensure vapors are not lost to the atmosphere when the system is not in use. As before, it would be the bulk

plant owner/operator's responsibility to ensure that all vapor lines are connected and that hatch covers on the tank truck are closed during gasoline transfers.

The proposed standards would require the bulk plant owner/operator to assure that any gasoline tank truck at a bulk plant, that is connected to a vapor balance system, has passed a vapor-tightness test within the last year. In addition, the vapor balance system would have to be designed so that the back pressure in the tank truck does not exceed the limits of the vapor-tightness test (450 mm of water pressure and 150 mm of water vacuum).

For bulk gasoline plants with an annual gasoline throughput less than 4,500,000 liters (1,200,000 gallons), the proposed standard would require submerged loading for outgoing gasoline tank trucks, but not the use of a vapor balance system. This exception is to relieve the economic burden on the small bulk gasoline plants. However, these plants would be required to keep records of gasoline throughput at the facility so that an inspector can verify that only submerged loading is required.

c. Storage Vessels at Service Stations.—Decision on Acceptable Risk. As stated earlier, the baseline MIR is about 5×10^{-6} , which is below the presumptive acceptable risk of approximately 1×10^{-4} . These risks were estimated considering typical colocation of service stations. The baseline annual incidence is about 0.1 case/year. The EPA also considered the noncancer health effects associated with benzene exposures at levels comparable to an MIR level of 5×10^{-6} . Noncancer health effects have been associated with exposure to benzene, but levels of benzene exposure reported to produce noncancer health effects are at least three orders of magnitude above the exposures predicted for these sources. After considering all of these factors, the EPA judged that emission levels at baseline represents an acceptable risk.

Decision on Ample Margin of Safety. The EPA considered selecting a level of emissions more stringent than the baseline level which was judged to represent an acceptable risk. Alternative 1 represented the extension nationwide of the level of control presently recommended by CTG for control in ozone nonattainment areas. This level of control would require all service stations with a gasoline throughput greater than 450,000 liters per year (120,000 gallons per year) to install a vapor balance system between the gasoline delivery truck and the service station storage vessel. As stated earlier, EPA estimates that this vapor balance system can reduce storage vessel filling

emissions by 95 percent. In addition, all loadings of service station storage vessels would be restricted to submerged filling.

Alternative 2 represented the same level of control as Alternative 1, except that vapor balance systems and submerged loading would be required on all service stations with no exceptions for small service stations.

Table E-4 shows the estimated costs and emission reductions achieved through the applications of the two alternatives for service stations. In comparing these alternatives, EPA considered the reductions in benzene risks, the control costs, the feasibility of achieving the control level of each alternative, and the cobenefits of control such as energy conservation, pollution prevention and secondary control of urban air toxics. Based on these factors, EPA decided that the level of control reflected by Alternative 1 provides an ample margin of safety. Although the existing emission level and risks are considered acceptable, they can be reduced further at a reasonable cost considering all the benefits of control. Application of the controls associated with Alternative 1 is estimated to reduce benzene risks to 2×10^{-7} and 0.06 case/year. In addition, although EPA was not able to estimate the cancer incidences associated with various risk levels, the incidences for risk levels above 1×10^{-6} would be lower under Alternative 2 than baseline. Benzene concentrations reported to produce noncancer health effects are at least two to three orders of magnitude above the levels expected for baseline and all the control alternatives. Consequently, noncancer health effects did not enter into the decision.

The EPA concluded that additional control beyond Alternative 1 is not warranted. Alternative 2 provides essentially the same level of protection as Alternative 1. The cost of the additional controls of Alternative 2 is disproportionately high considering the small gains in health protection and cocontrol benefits, such as energy conservation.

In conclusion, EPA decided that the emission level of Alternative 1 would protect the public health with an ample margin of safety. Therefore, EPA is proposing standards to limit emissions from underground storage tanks at service stations as described below.

Summary and Basis for Format of Standard. As with bulk gasoline plants, the proposed standard would require the installation of equipment for vapor balance and submerged filling. The standard is, therefore, in the format of an equipment standard. This format was

selected as the basis for the standard since the testing of this vapor balance system was considered both difficult and costly. In addition, the approach selected for regulating service stations was to extend the CTG recommendations nationwide, and these recommendations were in the form of an equipment standard.

The proposed standard would require all service stations with an annual gasoline throughput greater than 450,000 liters (120,000 gallons) to install submerged loading for the storage vessels. Service stations are defined as any facility, public or private, that refuels motor vehicles, and includes conventional service stations, convenience stores, private fleet operations (taxis, buses, government vehicles) and parking garages. The proposed standard would further require the installation of a vapor balance system between the gasoline tank truck and the service station storage vessel to capture and control emissions that occur during storage vessel filling. The proposed standard would require a restriction device on the vent of the gasoline storage vessel to enhance system efficiency. Also, all hose connections would be required to be vapor-tight during the gasoline transfer.

It would be the service station owner/operator's responsibility to ensure that the vapor line is connected during gasoline delivery. The standard suggests two methods to meet the intent of these requirements. These are an interlock which prevents gasoline unloading unless the vapor hose is connected, such as a bracket to which the product and vapor hose are permanently attached so that neither hose can be connected separately, and a closure in the vapor hose which remains closed unless the hose is attached to the vapor fitting on the truck. (Comments are specifically solicited regarding these methods.) It would also be the service station owner/operator's responsibility to ensure that all gasoline delivery tank trucks have documentation that they have passed a vapor-tightness test within the previous year. The owner/operator of the service station also would have the responsibility to ensure that tank truck hatches remain closed during the gasoline transfer.

Service stations with an annual gasoline throughput less than 450,000 liters (120,000 gallons) would not be required to install equipment. This exception was included to relieve the economic burden on small facilities. However, these service stations would be required to keep records of gasoline throughput at the facility so that an

inspector can verify that no equipment installation is required.

6. Impacts of Proposed Standards

a. Bulk Gasoline Terminals—The proposed regulation would result in a reduction of both baseline benzene and VOC emissions. Benzene emissions would decline from a baseline level of 1,900 Mg/yr to 800 Mg/yr, a reduction of 58 percent. Emissions of VOC would decline from a baseline level of 300,000 Mg/yr to 130,000 Mg/yr, a reduction of 57 percent. The estimated baseline incidence of leukemia from bulk gasoline terminals emitting benzene would be reduced from 0.12 to 0.08 case/year. The maximum individual lifetime risk would be reduced from 5×10^{-5} at the baseline level to 1×10^{-5} after implementation of this standard.

Potential environmental impacts of this standard depend on the vapor processor selected by each facility to attain compliance. Thermal oxidizers and flares are not expected to produce any wastewater or solid waste impacts. However, if carbon adsorbers are used, some minor wastewater and solid waste impacts can be expected from desorption of the carbon beds with steam, and from the final disposal of spent carbon. If refrigeration type recovery units are used, some minor wastewater impacts can be expected in conjunction with water disposal following gasoline/water separation. Because it is not known how many bulk gasoline terminals will employ carbon adsorbers or refrigeration type recovery units to comply with the standard, the wastewater and solid waste impacts of this standard cannot be quantified.

The total nationwide capital cost of the proposed regulation for bulk gasoline terminals is estimated to be \$630 million (1984 dollars), primarily for purchase and installation of vapor collection and processing systems. The total annualized cost is estimated to be \$48 million (1984 dollars). Approximately 900 (60 percent) of the 1,500 existing bulk gasoline terminals would have to install new vapor processing equipment and are expected to incur the majority of these costs.

b. Bulk Gasoline Plants—The proposed regulation would result in a reduction of both baseline benzene and VOC emissions. Benzene emissions would decline from a baseline level of 1,200 Mg/yr to 400 Mg/yr, a reduction of 67 percent. Emissions of VOC would decline from a baseline level of 200,000 Mg/yr to 70,000 Mg/yr, a reduction of 65 percent. The estimated baseline incidence of leukemia from bulk gasoline plants emitting benzene would be reduced from 0.05 to 0.02 case/year.

The maximum individual lifetime risk would be reduced from 1×10^{-5} at the baseline level to 2×10^{-6} after implementation of this standard.

The total nationwide capital cost of the proposed regulation for bulk gasoline plants is estimated to be \$200 million (1984 dollars), primarily for purchase and installation of vapor balance systems. The total annualized cost is estimated to be \$31 million (1984 dollars). Approximately 8,000 (53 percent) of the 15,000 existing bulk gasoline plants would have to install new vapor collection systems and are expected to incur the majority of these costs.

c. Storage Vessels at Service Stations—The proposed regulation would result in a reduction of both baseline benzene and VOC emissions. Benzene emissions would decline from a baseline level of 1,700 Mg/yr to 500 Mg/yr, a reduction of 71 percent. Emissions of VOC would decline from a baseline level of 280,000 Mg/yr to 90,000 Mg/yr, a reduction of 68 percent. The estimated baseline incidence of leukemia from service stations emitting benzene would be reduced from 0.13 to 0.06 case/year. The maximum individual lifetime risk would be reduced from 5×10^{-6} at the baseline level to 2×10^{-7} after implementation of this standard.

The total nationwide capital cost of the proposed regulation for service stations is estimated to be \$100 million (1984 dollars), primarily for the purchase and installation of vapor balance and submerged filling equipment. The total annualized cost is estimated to be \$20 million (1984 dollars). Approximately 77,000 (20 percent) of the 390,000 existing service stations would have to install the vapor balance and submerged filling equipment and are expected to incur the majority of these costs.

7. Request for Comments

The EPA solicits comments on the following aspects of today's proposed regulation of the gasoline marketing system. In estimating benzene exposure, EPA relied on model plants and air dispersion modeling. The EPA requests comments on whether the model plants accurately represent the existing population of bulk gasoline terminals, bulk gasoline plants, and underground storage tanks at service stations. The EPA also solicits comments on other available control alternatives, their costs, and their expected emission reductions.

In decisions on control levels to provide an ample margin of safety, EPA includes consideration of the appropriate balance among the benefits

of control of hazardous air pollutants, cocontrol of other pollutants, cost and technical feasibility. A significant factor in the judgments on these three gasoline marketing categories was the cocontrol of VOC achieved by the alternatives in addition to the primary benefit of reducing benzene emissions. Environmental benefits of this VOC control include savings from recovery of gasoline vapors that would otherwise be lost to the atmosphere, reductions in deterioration of air quality in areas that are marginally in attainment with the ozone standard, and reductions in air toxics in smaller urban areas. Since a significant effect of these NESHAP is to reduce VOC emissions in ozone attainment areas, EPA is interested in comment on the value of and need for extending these control requirements nationwide. The EPA is also interested in comment on the potential for conflict between State, local, and private sector resource needs to implement the gasoline marketing NESHAP and the resource needs to bring many areas into attainment for ozone.

VII. Administrative Requirements

A. Paperwork Reduction Act

The information collection provisions associated with the proposed rules have been submitted for approval to OMB under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 et seq. Information Collection Request documents have been prepared by EPA (ICR Nos. 1154, 1155, 1412, and 1541) and copies may be obtained from the Information Policy Branch (PM-223), EPA, 401 M Street SW., Washington, DC 20460. The public reporting burden for each collection of information, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information, is estimated as follows: the source category of benzene transfer operations is estimated to average 379 hours annually per response; the source category of industrial solvent use are estimated to average 268 hours annually per response; the source categories of benzene waste operations is estimated to average 172 hours annually per response; the source categories of gasoline marketing are estimated to average 4 hours annually per response (175 hours if a performance test is conducted) per bulk terminal, 1 hour annually per response for bulk plants, and 1 hour annually per response for service stations.

Send comments regarding the burden estimates or any other aspect of this collection of information, including

suggestions for reducing this burden, to Chief, Information Policy Branch (PM-223), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Desk Officer for EPA." The final rules will respond to any OMB or public comments on the information collection requirements contained in this proposal.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 et seq.) requires EPA to consider potential impacts of proposed regulations on small business entities. If a preliminary analysis indicates that a proposed regulation would have a significant economic impact on 20 percent or more of small entities, then a regulatory flexibility analysis must be prepared.

Present Regulatory Flexibility Act guidelines indicate that an economic impact should be considered significant if it meets one of the following criteria: (1) compliance increases annual production costs by more than 5 percent, assuming costs are passed on to consumers; (2) compliance costs as a percentage of sales for small entities are at least 10 percent more than compliance costs as a percentage of sales for large entities; (3) capital costs of compliance represent a "significant" portion of capital available to small entities, considering internal cash flow plus external financial capabilities; and (4) regulatory requirements are likely to result in closures of small entities.

1. Benzene Emissions from Chemical Manufacturing Process Vents

The source category of chemical manufacturing process vents is not being regulated. Therefore, there is no impact on these sources and a regulatory flexibility analysis is not required.

2. Benzene Transfer Operations

The source category of benzene transfer operations includes benzene production facilities and bulk terminals at which benzene is loaded into tank trucks, railcars, or marine vessels. Tank trucks, railcars, and marine vessels are included in SIC 44, 4742, 4212, 4213, and 4214. Because of the uncertainty concerning the actual cost distribution for tank trucks, railcars, and marine vessels, assessment of the likelihood of significant economic impact on small entities is difficult. However, the entities involved in benzene transfer operations are expected to constitute less than 20 percent of all the small entities involved

in SIC 44, 4742, 4212, 4213, and 4214. Therefore, since a substantial number of small entities are not being regulated, a regulatory flexibility analysis is not required.

In regard to benzene producers and bulk terminals, less than five percent of benzene storage facilities are owned by independent bulk storage terminal operators. The rest are owned by benzene producers and consumers which are generally large chemical companies. The standard exempts facilities with an annual throughput of less than 0.3 million gallons or those loading material of less than 70 percent by weight of benzene. These exemptions allow facilities that only load benzene periodically throughout the year and those loading other products such as gasoline that are not predominately benzene to not be required to install additional control. The annualized capital costs for the smallest bulk terminal not exempted would only be \$222/year. Volatility of benzene supply has led to price swings as dramatic as that of \$0.80 to \$2.50 a gallon between 1986 and 1987 without significant changes in the quantity of benzene used. Therefore, the less than two percent anticipated increase in the cost of producing benzene is expected to be passed through as an increase in the price of benzene. Because the impacts are not expected to be significant, a regulatory flexibility analysis is not required.

3. Benzene Waste Operations

Because of the uncertainty concerning the actual cost distribution, assessment of the likelihood of significant economic impact on substantial numbers of small entities is difficult. However, several factors combine to make it unlikely that a regulatory flexibility analysis is needed. First, the definition of small entities in SIC 28 (Chemicals and Allied Products) ranges from 500 to 1000 employees as an upper bound for an entity to be considered small. Similarly, the upper bound for employees in SIC 29 (Petroleum Refining and Related Industries) is 1,500. The regulated facilities are unlikely to be owned by small entities for two reasons. First, there are few small entities in these two industries. Second, there is a cutoff for sources generating small quantities of benzene waste, measured as the total annual quantity of benzene in the waste. Facilities subject to the cutoff are required only to keep records and make reports to verify their exemption. The average economic impact is also unlikely to be significant. Therefore, since the proposed regulation is unlikely

to impose a significant economic impact on a substantial number of small entities, a regulatory flexibility analysis is not required.

4. Industrial Solvent Use

The industrial solvent use source category includes benzene solvent use in the manufacture of rubber tires and pharmaceuticals. No small entities in either rubber tire manufacturing (SIC 3011) or pharmaceutical manufacturing (SIC 2834) have been identified that would be affected by the proposed regulation. Therefore, no regulatory flexibility analysis is required.

5. Gasoline Marketing System

This group of source categories includes bulk gasoline terminals, bulk plants, and gasoline service stations. With regard to bulk terminals (SIC 5171), the definition of a small business is an entity with less than 500 employees. Probably more than 20 percent of the bulk terminal industry can be considered as small businesses according to this criterion. Almost two-thirds of the facilities, however, are already controlled to the required level. Control requirements result in a percentage cost increase of less than 0.2 percent and is not expected to cause significant impacts. Therefore, a regulatory flexibility analysis is not required.

Since bulk plants average less than 10 employees, many of the entities owning bulk terminal plants are expected to be small businesses. Almost half of the facilities are already controlled to the required level. The smaller bulk plants (less than 4,000 gallons/day) have much lower control requirements. The percentage cost increase is less than 0.2 percent for the more stringent control requirements and is not expected to cause significant impacts. Therefore, a regulatory flexibility analysis is not required.

For gasoline service stations, the definition of small business (SIC 5541) is an entity with less than \$4.5 million in sales. The definition of a small business for convenience stores (SIC 5399, 5499, and 5999), is an entity with less than \$3.5 million in sales. More than 20 percent of service stations are expected to be considered small by these criteria. Almost half of the facilities, however, are already controlled to the required level. The percentage costs increase for the ones requiring control is less than 0.2 percent and is not expected to cause significant impacts. The smaller service stations (less than 10,000 gallons/month) are exempted from control requirements. Therefore, a regulatory flexibility analysis is not required.

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that these proposed rules, if promulgated, will not have a significant economic impact on a substantial number of small business entities.

C. Public Hearing

A public hearing will be held, if requested, to discuss the proposed actions in accordance with Sections 112(b)(1)(B) and 307(d)(5) of the CAA. Persons wishing to make oral presentations should contact EPA at the address given in the **ADDRESSES** section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement before, during, or within 30 days after the hearing. Written statements should be addressed to the Air Docket Section, address given in the **ADDRESSES** section of this preamble and should refer to the applicable Docket No. (see **ADDRESSES** section for Docket No. for each source category).

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at the EPA's Air Docket Section in Washington, DC (see **ADDRESSES** section of this preamble).

D. Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered by EPA in the development of this proposed rulemaking. The principal purposes of the docket are: (1) To allow interested parties to identify and locate documents so that they can participate effectively in the rulemaking process; and (2) to serve as the record in case of judicial review (except for interagency review materials [307(d)(7)(A)]).

E. Executive Order 12291

Under Executive Order 12291, EPA is required to judge whether a regulation is "major" and therefore subject to the requirement of a Regulatory Impact Analysis. The criteria set forth in Section 1 of the Order for determining whether a regulation is a major rule are as follows: (1) is likely to have an annual effect on the economy of \$100 million or more; (2) is likely to cause a major increase in costs or prices for consumers, individual industries, Federal, State, or local governments, or geographic regions; or (3) is likely to result in significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

None of the regulations being proposed are major because: (1) nationwide annual compliance costs are below the threshold of \$100 million; (2) the proposed regulations do not significantly increase prices or production costs; and (3) the proposed regulations do not result in significant adverse effects on domestic competition, employment, investment, productivity, innovation, or competition in foreign markets.

All of the proposed regulations presented in this notice were submitted to OMB for review as required by Executive Order 12291. Any written comments from OMB to EPA and any written EPA response to those comments will be included in the dockets listed at the beginning of today's notice under **ADDRESSES**. These dockets are available for public inspection at the EPA's Air Docket Section, which is listed in the **ADDRESSES** section of this preamble.

F. Miscellaneous

As prescribed by Section 112 of the CAA, as amended, establishment of today's proposed national emissions standards was preceded by the Administrator's listing of benzene as a hazardous air pollutant on June 8, 1977 (42 FR 29332).

In accordance with Section 117 of the Act, publication of these actions on benzene was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies to the maximum extent practical.

G. Request for Comments

Throughout this notice, comments and information are requested on specific areas. Major areas on which the EPA requests public comment include:

1. Are the methods specified in Subpart BB for determining vapor tightness of marine vessels appropriate? Because there is limited experience in this, EPA is interested in comment on the suitability and comparability of the alternative proposed methods.

2. How should EPA consider cocontrol of other pollutants in judgments on control levels that provide an ample margin of safety? For several source categories considered in this notice, EPA considered reductions in VOC emissions in the balancing of costs and the additional health benefits. This question is particularly relevant where the risks and risk reduction are small.

3. In the ample margin of safety decisions, how should EPA make a reasonable cost determination when VOC emissions are cocontrolled in

ozone nonattainment areas? And ozone attainment areas? This question is of particular relevance to the ample margin of safety decisions for the three gasoline marketing source categories.

4. Information on alternative control technologies not considered in the various analyses.

5. Additional information on the control techniques considered in the various alternatives. The EPA is especially interested in the control alternatives that were selected to provide an acceptable risk and an ample margin of safety.

6. Furthermore, since a significant effect of the gasoline NESHAP is to reduce gasoline vapor emissions (which include benzene) in ozone attainment areas, EPA is interested in comment on the value of extending these controls nationwide. The EPA is also interested in comment on possible conflicts between State, local, and private sector resources needed to implement these standards and the resource needs to bring many areas into attainment for ozone.

7. In estimating benzene emissions from waste operations, EPA has relied on limited information from several existing emission sources. The following additional information is needed to reduce uncertainties in the estimates:

a. The EPA procedures for estimating emissions and any actual quantification of benzene emissions from waste operations.

b. The types of operations and wastes that would require accumulation, and the maximum accumulation periods being analyzed by EPA.

c. Alternative methods or approaches that would demonstrate that the treatment process is being operated as designed to reduce benzene emissions.

List of Subjects in 40 CFR Part 61

Asbestos, Benzene, Beryllium, Coke oven emissions, Hazardous substances, Incorporation by reference, Inorganic arsenic, Intergovernmental relations, Mercury, Radionuclides, Reporting and recordkeeping requirements, Vinyl chloride, Volatile hazardous air pollutants.

Dated: August 31, 1989.

F. Henry Habicht,
Acting Administrator.

It is proposed to amend 40 CFR Part 61 by adding paragraph (c) to § 61.18 and by adding Subpart AA, Subpart BB, Subpart CC, Subpart DD, Subpart EE, Subpart FF, and Subpart GG as follows:

1. The authority for Part 61 continues to read as follows:

Authority: Secs. 101, 112, 114, 116, 301 of the Clean Air Act, as amended (42 U.S.C. 7401, 7412, 7414, 7416, 7601).

2. Section 61.18 is amended by adding paragraph (c) as follows:

§ 61.18 Incorporations by reference.

(c) The following material is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325, telephone (202) 783-3238.

(1) SW-846, Test Methods for Evaluating Solid Waste, third edition, Order Number 955-001-00000-1.

(i) Method 8020, Aromatic Volatile Organics (to be approved at promulgation) for § 61.355(c)(3)(i).

(ii) Method 8021, Determination of Volatile Organic Compounds by Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detection (to be approved at promulgation) for § 61.355(c)(3)(ii).

(iii) Method 8240, Gas Chromatography Mass Spectrometry for Volatile Organics (to be approved at promulgation) for § 61.355(c)(3)(iii).

(iv) Method 8260, Gas Chromatography/Mass Spectrometry for Volatile Organics: Capillary Column Technique (to be approved at promulgation) for § 61.355(c)(3)(iv).

3. Subpart AA is added as follows:

Subpart AA—National Emission Standard for Benzene Emissions From Industrial Solvent Use at Pharmaceutical Manufacturing Facilities

Sec.

61.290 Applicability and designation of affected facility.

61.291 Definitions.

61.292 Standards.

61.293 Monitoring requirements.

61.294 Test methods and procedures.

61.295 Reporting and recordkeeping.

61.296 Delegation of authority.

Subpart AA—National Emission Standard for Benzene Emissions From Industrial Solvent Use at Pharmaceutical Manufacturing Facilities

§ 61.290 Applicability and designation of affected facility.

(a) The provisions of this subpart apply to all process vents from a pharmaceutical manufacturing process unit where benzene is used as a solvent.

§ 61.291 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given to them in the Act, or in Subpart A or Subpart V of Part 61.

"Batch cycle" means the time period from reactant introduction into any noncontinuous process or operation,

which is not characterized by steady-state conditions and in which reactions are not added and products are not removed simultaneously, until product removal.

"Benzene" means any liquid material containing benzene except benzene-laden waste [covered under Subpart FF of Part 61].

"Benzene used as a solvent" means benzene which is utilized for its ability to dissolve another solvent to form a uniformly dispersed mixture.

"Process unit" means any components of an affected facility that are assembled and connected by pipes or ducts to produce a product. A process unit can operate independently if supplied with sufficient feed or raw materials and sufficient product storage facilities.

"Process vent stream" means any gas discharged to the atmosphere from a process unit. This term does not include relief valve discharges and equipment leaks (including, but not limited to, leaks from pumps, compressors, sample connectors, and valves.)

§ 61.292 Standards.

(a) Each owner or operator of a facility subject to the provisions of this subpart shall comply with paragraphs (a)(1) or (a)(2) of this section. Each owner or operator shall:

(1) Route each process stream that emits benzene to a control device or a combination of control devices that achieve a total emission reduction of at least 95 weight percent. If a boiler or process heater is used to comply with this paragraph, the vent stream shall be introduced into the flame zone of the boiler or process heater.

(2) Maintain benzene emissions below 1 Mg per year.

§ 61.293 Monitoring requirements.

(a) Each owner or operator of an affected facility that uses a carbon adsorber to comply with the requirements of § 61.292(a) shall comply with the monitoring provisions of paragraph (a)(1) of this section and either paragraph (a)(2) or (a)(3) of this section, as appropriate.

(1) Install, calibrate, maintain, and operate according to manufacturer's specifications, a flow indicator that provides a record of vent stream flow to the carbon adsorber during the entire batch cycle. The owner or operator shall install the flow indicator in the vent stream at the point closest to the inlet to each carbon adsorber.

(2) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, install

calibrate, maintain, and operate, according to the manufacturer's specifications, a monitoring device that continuously indicates and records the concentration level of benzene in either the control device outlet gas stream or in both the control device inlet and outlet gas streams. The outlet gas stream shall be monitored if the percent increase in the concentration level of benzene is used as the basis for reporting, as described in § 61.295(a)(1)(i). The inlet and outlet gas streams shall be monitored if the percent control device efficiency is used as the basis for reporting, as described in § 61.295(a)(1)(ii).

(3) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, install, calibrate, maintain, and operate, according to the manufacturer's specifications, a monitoring device that continuously indicates and records the concentration level of benzene in the outlet gas stream for a minimum of one complete adsorption cycle per day for each adsorber vessel. The owner or operator of an affected facility may also monitor and record the concentration level of benzene in the common carbon adsorption system inlet gas stream or in each individual carbon adsorber vessel inlet stream. The outlet gas streams shall be monitored if the percent increase in the concentration level of benzene is used as the basis for reporting, as described in § 61.295(a)(1)(i). In this case, the owner or operator of an affected facility shall compute daily a 3-day rolling average concentration level of organics in the outlet gas stream from each individual adsorber vessel. The inlet and outlet gas streams shall be monitored if the percent control device efficiency is used as the basis for reporting, as described in § 61.295(a)(1)(ii). In this case, the owner or operator of an affected facility shall compute daily a 3-day rolling average efficiency for each individual adsorber vessel.

(b) Each owner or operator of an affected facility that uses an incinerator to seek to comply with the percent reduction requirement specified under § 61.292(a)(1) shall install, calibrate, maintain, and operate the following equipment according to the manufacturer's specifications:

(1) A temperature monitoring device equipped with a continuous recorder and having an accuracy of ± 1 percent of the temperature being measured expressed in degrees Celsius or $\pm 0.5^\circ\text{C}$, whichever is greater.

(i) Where an incinerator other than a catalytic incinerator is used, a

temperature monitoring device shall be installed in the firebox.

(ii) Where a catalytic incinerator is used, temperature monitoring devices shall be installed in the gas stream immediately before and after the catalyst bed.

(2) A flow indicator installed, calibrated, maintained, and operated according to manufacturer's specifications that provides a record of vent stream flow to the incinerator during the entire batch cycle. The flow indicator shall be installed in each vent stream at a point closest to the inlet of each incinerator.

(c) An owner or operator of an affected facility seeking to demonstrate compliance with the standards specified under § 61.292(a) with control or recovery devices other than a carbon adsorber or incinerator shall provide the Administrator with information describing the operation of the control device and the process parameter(s) that would indicate proper operation and maintenance of the device. The Administrator may request further information and then shall specify appropriate monitoring procedures or requirements.

§ 61.294 Test methods and procedures.

(a) The following test procedures shall be used for determining compliance with § 61.292(a):

(1) For continuous vents or processes, performance testing shall be conducted when the facility is at full operating conditions and flowrates. For batch processes, performance testing must be conducted for at least three emission events. During each emission event, the process vent flowrate and benzene concentration shall be determined by continuous integrated sampling.

(2) The time period for a performance test shall be as follows:

(i) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, the test shall consist of at least three separate runs. Each run shall coincide with a complete adsorption cycle of an individual adsorber vessel such that an adsorption cycle for each vessel is included in at least one run.

(ii) For carbon adsorption systems with individual exhaust stacks, each adsorber vessel shall be tested individually. Each test shall coincide with a complete adsorption cycle.

(iii) For incinerators and any other control devices applied to batch processes, performance testing shall be conducted during at least three batch cycles. For incinerators and any other control devices applied to continuous

processes, each test shall consist of three runs.

(3) The owner or operator of an affected facility shall use the following test methods contained in Appendix A of 40 CFR part 60 to determine values for use in the equations in paragraph (a)(4) of this section:

(i) Method 1 or 1A for determination of sample and velocity traverses, as applicable.

(ii) Method 2, 2A, 2C, or 2D for determination of velocity and volumetric flow rates, as applicable.

(iii) Method 18 for determination of benzene concentration at the inlet and outlet of the control device.

(4) The percent reduction of the control device shall be calculated as follows:

(i) The mass emitted during each testing cycle shall be calculated as follows (equation 1):

Equation 1:

$$M_{ei} = KV_iCL$$

Where:

M_{ei} = Mass of benzene emitted during testing cycle i , kg.

V_i = Volume of air-vapor mixture exhausted, m^3 at standard conditions.

C = Benzene concentration as measured by Method 18 at the exhaust vent, ppmv.

K = Density of calibration gas, (kg/m^3) , at standard conditions.

$K = 3.25$ for benzene.

L = Conversion factor, $(\text{m}^3 \text{ benzene}/\text{m}^3 \text{ air})$ (1/ppmv).

$= 10^{-6}$

s = Standard conditions, 20°C and 760 mm Hg .

(ii) The benzene mass emission rates before and after the control device shall be calculated as follows (equation 2):

Equation 2:

$$E = \frac{\sum_{i=1}^n M_{ei}}{T}$$

Where:

E = Mass flow rate of benzene emitted, kg/hr .

M_{ei} = Mass of benzene entering the control device or emitted during testing cycle i , kg.

T = Total time of all testing cycles, hr.

n = Number of testing cycles.

(iii) The percent reduction across the control device shall be calculated as follows for each test cycle (equation 3):

Equation 3:

$$R = \frac{E_b - E_a}{E_b} \cdot 100$$

Where:

R = Control efficiency of control device for test cycle i, %.

E_b = Mass flow rate of benzene prior to control device (from Equation (2)), kg/hr.

E_a = Mass flow rate of benzene after the control device (from Equation (2)), kg/hr.

(iv) The average percent reduction across the control device shall be calculated as follows (equation 4):

Equation 4:

$$P_a = \frac{\sum_{i=1}^n R_i}{n}$$

Where:

P_a = Average control efficiency of control device, %.

R_i = Control efficiency of control device for test cycle i (from Equation (3), %.

n = Number of test cycles.

(b) Any owner or operator of an affected facility that seeks to comply with the percent reduction requirement in § 61.292(a)(1) with a device other than a carbon adsorber or incinerator shall apply to the Administrator for approval of an alternative procedure for demonstrating compliance.

(c) Any owner or operator of an affected facility that seeks to comply with § 61.292(a)(2) shall calculate the annual benzene emission rate in the process vent stream as follows:

$$A = EH (1/1000)$$

Where:

A = Annual emission rate in Mg/yr.

E = Mass flow rate of benzene emitted, kg/hr (refer to equation (2) in paragraph (a)(4) of this section for the calculation procedure).

H = Hours per year gases are released to the atmosphere through the vent.

1/1000 = conversion from kg/yr to Mg/yr.

§ 61.295 Reporting and recordkeeping.

(a) Each owner or operator of an affected facility subject to the provisions of this subpart shall keep an up-to-date, readily accessible record of the following data measured during each performance test, and also include the following data in the report of the initial performance test required under § 61.13.

(1) Where an owner or operator of an affected facility demonstrates compliance with § 61.292 (a)(1) or (a)(2) through the use of a carbon adsorption

system, the data listed below shall be recorded:

(i) For those affected facilities monitoring only the carbon adsorption system outlet concentration level of benzene, the data specified in paragraph (a)(1)(i)(A) or (a)(1)(i)(B) of this section.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, the average benzene concentration level measured during three consecutive system rotations through the adsorption cycles of all the individual adsorber vessels.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, the average benzene concentration level measured on a 3-day rolling average for each adsorber vessel.

(ii) For those affected facilities monitoring both the carbon adsorption system inlet and outlet concentration of benzene, the data specified in paragraphs (a)(1)(ii)(A) or paragraphs (a)(1)(ii)(B) of this section.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, the average control efficiency measured during three consecutive adsorption cycles.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, the average control efficiency measured on a 3-day rolling average.

(2) Where an owner or operator of an affected facility demonstrates compliance with § 61.292(a)(1) through the use of an incinerator:

(i) The average firebox temperature of the incinerator (or the average temperature upstream and downstream of the catalyst bed), measured at least every 10 minutes during a batch cycle if the total time period of the batch cycle is less than 3 hours and every 15 minutes if the total time period of the batch cycle is equal to or greater than 3 hours. The measured temperature shall be averaged over the batch cycle.

(ii) The percent reduction of benzene determined as specified in § 61.294(a)(3) achieved by the incinerator.

(3) Where an owner or operator subject to the provisions of this subpart demonstrates compliance with § 61.292(a)(2), all emission test measurements and calculations of annual emission rate shall be recorded.

(4) Where an owner or operator of an affected facility demonstrates compliance with § 61.292 (a)(1) or (a)(2) through use of a device other than a carbon adsorber or an incinerator, those data specified in 61.293(c) that would indicate proper operation and maintenance of the device shall be recorded.

(b) Each owner or operator of an affected facility shall keep up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored under § 61.293(a) as well as up-to-date, readily accessible records of periods of operation during which the parameter boundaries established during the most recent performance test are exceeded. The Administrator may at any time require a report of these data. Periods of operation during which the parameter boundaries established during the most recent performance tests are exceeded are defined as follows:

(1) For carbon adsorption systems, the data specified below shall be recorded.

(i) For those affected facilities monitoring only the carbon adsorption system outlet concentration levels of benzene, the periods specified in (b)(1)(i)(A) or (b)(1)(i)(B) of this section, as applicable.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, all periods of three consecutive system rotations through the adsorption cycle of all the individual adsorber vessels during which the average benzene concentration in the common outlet gas stream is more than 20 percent greater than the average value measured during the most recent performance test that demonstrated compliance.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, all 3-day rolling averages for each adsorber vessel when the benzene concentration level in the individual outlet gas stream is more than 20 percent greater than the average value for that adsorber vessel measured during the most recent performance test that demonstrated compliance.

(ii) For those affected facilities monitoring the carbon adsorption system inlet and outlet concentration of benzene, the data specified in (b)(1)(ii)(A) or (b)(1)(ii)(B) of this section, as applicable.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, all periods of three consecutive adsorption cycles during which the average system control efficiency is below 95 percent.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, all 3-day rolling averages for each adsorber vessel when the system control efficiency is below 95 percent.

(2) For thermal incinerators, all loading cycles during which the average combustion temperature was more than 28°C (50°F) below the average

combustion temperature during the most recent performance test at which compliance with § 61.292(a) was determined.

(3) For catalytic incinerators, all loading cycles during which the average temperature of the vent stream immediately before the catalyst bed is more than 28 °C (50 °F) below the average temperature of the process vent stream during the most recent performance test at which compliance with § 61.292(a) was determined.

(4) For devices other than carbon adsorbers and incinerators, the parameter boundaries shall be specified by the Administrator.

(c) Each owner or operator of an affected facility shall keep up-to-date, readily accessible, continuous records of the indication of flow specified under §§ 61.293(a)(1) and 61.293(b)(2), as well as up-to-date, readily accessible records of all periods when the vent stream is diverted from the control device during the batch cycle.

(d) Each owner or operator subject to the requirements of § 61.292 shall submit to the Administrator the initial report within 90 days after the effective date of this subpart or 90 days after startup for a source that has an initial startup date after the effective date. The owner or operator shall also submit to the Administrator quarterly reports of the following information.

(1) Exceedances of monitored parameters recorded under § 61.295(b).

(2) All periods recorded under § 61.295(c) when the vent stream is diverted from the control device.

§ 61.296 Delegation of authority.

(a) In delegating implementation and enforcement to a State under section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: No restrictions.

4. Subpart BB is added as follows:

Subpart BB—National Emission Standard for Benzene Emissions from Benzene Transfer Operations

Sec.

61.300 Applicability.

61.301 Definitions.

61.302 Standards.

61.303 Monitoring requirements.

61.304 Test methods and procedures.

61.305 Reporting and recordkeeping.

61.306 Delegation of authority.

Subpart BB—National Emission Standard for Benzene Emissions From Benzene Transfer Operations

§ 61.300 Applicability.

(a) The affected facility to which this subpart applies is the total of all loading racks at which benzene is loaded into tank trucks, railcars, or marine vessels at each benzene production facility and each bulk terminal.

(b) Any affected facility under paragraph (a) of this section which loads only material containing less than 70 weight percent benzene is exempt from the requirements of this subpart, except for the recordkeeping and reporting requirements in § 61.305(j).

(c) Any affected facility under paragraph (a) of this section whose annual benzene loading is less than 1.3 million liters is exempt from the requirements of this subpart, except for the recordkeeping and reporting requirements in § 61.305(j).

(d) The owner or operator of an affected facility, as defined in § 61.300(a) that loads a marine vessel shall be in compliance with the railcar, the marine vessel loading racks shall be in compliance with the provisions of this subpart on and after February 1, 1991, while the tank truck loading racks and the railcar loading racks shall be in compliance as required by § 61.12.

§ 61.301 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act or in subpart A or subpart V of part 61.

"Benzene" means any liquid material containing benzene except benzene-laden waste [covered under subpart FF of part 61], gasoline [service station storage covered under 40 CFR part 61, subpart CC, bulk gasoline terminals and plants covered under subparts DD and EE, respectively], or benzene-laden liquid from coke by-product recovery plants.

"Bulk terminal" means any facility which receives liquid product containing benzene by pipeline, marine vessel, tank trucks, or rail cars, and loads the product for further distribution into tank trucks, rail cars, or marine vessels.

"Control device" means all equipment used for recovering or oxidizing benzene vapors displaced from the affected facility.

"Incinerator" means any enclosed combustion device that is used for destroying organic compounds and that does not extract energy in the form of steam or process heat.

"Leak" means any instrument reading of 10,000 ppmv or greater using Method 21 of 40 CFR part 60, Appendix A.

"Loading cycle" means the time period from the beginning of filling a tank truck, railcar, or marine vessel until flow to the control device ceases, as measured by the flow indicator.

"Loading rack" means the loading arms, pumps, meters, shutoff valves, relief valves, and other piping and valves necessary to fill tank trucks, railcars, or marine vessels.

"Marine vessel" means any tankship or tank barge which transports liquid product such as benzene.

"Nonvapor tight" means any tank truck, railcar, or marine vessel that does not pass the required vapor tightness test.

"Process heater" means a device that transfers heat liberated by burning fuel to fluids contained in tubes, except water that is heated to produce steam.

"Steam generating unit" means any enclosed combustion device that uses fuel energy in the form of steam.

"Vapor collection system" means any equipment located at the affected facility used for containing benzene vapors displaced during the loading of tank trucks, railcars, or marine vessels. This does not include the vapor collection system that is part of any tank truck, railcar, or marine vessel vapor collection manifold system.

"Vapor-tight marine vessel" means a marine vessel with a benzene product tank that has been demonstrated within the preceding 12 months to have no leaks. This demonstration shall be made using Method 21 of part 60, Appendix A during the last 20 percent of loading and during a period when the vessel is being loaded at its maximum loading rate. A reading of greater than 10,000 ppm as methane shall constitute a leak. As an alternative, a marine vessel owner or operator may use the vapor tightness test described in § 61.304(h) to demonstrate vapor-tightness. A marine vessel operated at negative pressure is assumed to be vapor-tight for the purpose of this standard.

"Vapor-tight tank truck" or "vapor-tight railcar" means a tank truck or railcar for which it has been demonstrated within the preceding 12 months that its product tank will sustain a pressure change of not more than 750 pascals within 5 minutes after it is pressurized to 4,500 pascals. This capability is to be demonstrated using the pressure test procedure specified in Method 27 of part 60, Appendix A.

"Waste" means any material resulting from industrial, commercial, mining, or agricultural operations, or from community activities that is discarded or is being accumulated, stored, or physically, chemically, thermally, or

biologically treated prior to being discarded, discharged, or recycled.

§ 61.302 Standards.

(a) The owner or operator of an affected facility shall equip each loading rack with a vapor collection system that is:

(1) Designed to collect all benzene vapors displaced from tank trucks, railcars, or marine vessels during loading; and

(2) Designed to prevent any benzene vapors collected at one loading rack from passing through another loading rack to the atmosphere.

(b) The owner or operator of an affected facility shall install a control device and reduce benzene emissions routed to the atmosphere through the control device by 98 weight-percent. If a boiler or process heater is used to comply with the percent reduction requirement, then the vent stream shall be introduced into the flame zone of such a device.

(c) The owner or operator of an affected facility shall operate any flare used to comply with paragraph (b) of this section in accordance with the requirements of § 60.18 except for § 60.18 (c)(4)(ii), (c)(4)(iii), (c)(5), (f)(5), and (f)(6). In lieu of complying with these sections, owners or operators shall comply with § 61.304(c) of this subpart.

(d) The owner or operator of an affected facility shall limit loading of benzene into vapor-tight tank trucks and vapor-tight railcars using the following procedures:

(1) The owner or operator shall obtain the vapor-tightness documentation described in § 61.305(h) for each tank truck or railcar loaded at the affected facility. The test date in the documentation must be within the preceding 12 months. The vapor-tightness test to be used for tank trucks and railcars is Method 27 of part 60, Appendix A.

(2) The owner or operator shall cross-check the identification number for each tank truck or railcar to be loaded with the file of vapor-tightness documentation before the corresponding tank truck or railcar is loaded. If no documentation is on file, the owner or operator shall obtain a copy of the information from the tank truck or railcar operator before the tank truck or railcar is loaded.

(3) Alternate procedures to those described in (d) (1) and (2) of this section may be used upon application to, and approval by, the Administrator.

(e) The owner or operator of an affected facility shall limit the loading of marine vessels to those vessels that are vapor-tight as determined by either

paragraph (e)(1), (e)(2), (e)(3) or (e)(4) of this section.

(1) The owner or operator of an affected facility shall ensure that each marine vessel is loaded with the benzene product tank below atmospheric pressure (i.e., at negative pressure). If the pressure is measured at the interface between the shoreside vapor collection pipe and the marine vessel vapor line, the pressure measured according to the procedures in § 61.303(f) must be between 0 psig and 0.3 psig below atmospheric pressure.

(2) The owner or operator of an affected facility shall use the following procedure to obtain the vapor-tightness documentation described in § 61.305(h). The vapor-tightness test for marine vessels is Method 21 of part 60, Appendix A. A reading of 10,000 ppmv or greater as methane shall constitute a leak.

(i) The owner or operator of an affected facility shall obtain the leak test documentation described in § 61.305(h) for each marine vessel prior to loading, if available. The date of the test listed in the documentation must be within the 12 preceding months.

(ii) If no test has been conducted on the marine vessel in the preceding 12 months, the owner or operator of an affected facility shall require that a leak test of the marine vessel be conducted during the final 20 percent of loading of the marine vessel. The test shall be conducted when the marine vessel is being loaded at the maximum allowable loading rate.

(A) If no leak is detected, the owner or operator of an affected facility shall require that the documentation described in § 61.305(h) is completed. The owner or operator of the affected facility shall retain a copy of the vapor-tightness documentation on file.

(B) If any leak is detected, the owner or operator of an affected facility shall require that the vapor-tightness failure be documented for the marine vessel owner or operator.

(iii) If the marine vessel has failed one vapor-tightness test in the preceding 12 months as described in § 61.302(e)(2)(ii), the owner or operator of the affected facility shall require that the owner or operator of the nonvapor-tight marine vessel provide documentation that the leaks detected during the previous vapor-tightness test have been repaired. Once the repair documentation has been provided, the owner or operator may load the marine vessel. The owner or operator shall require that the vapor-tightness test described in § 61.302(e)(2)(ii) be conducted during loading.

(iv) If the marine vessel has failed more than one vapor-tightness test described in § 61.302(e)(2)(ii) in the preceding 12 months, the owner or operator of the affected facility shall not allow the marine vessel to be loaded until the marine vessel owner or operator provides proof of vapor-tightness test described in § 61.304(h).

(3) The owner or operator of an affected facility shall obtain a copy of the marine vessel's vapor-tightness documentation described in § 61.305(h) for a test conducted within the preceding 12 months in accordance with § 61.304(h).

(4) Alternate procedures to those described in (e)(1), (e)(2) and (e)(3) of this section may be used upon application to, and approval by, the Administrator.

(f) The owner or operator of an affected facility shall limit loading of benzene to tank trucks, railcars, and marine vessels equipped with vapor collection equipment that is compatible with the affected facility's vapor collection system.

(g) The owner or operator of an affected facility shall limit loading of tank trucks, railcars, and marine vessels to tank trucks, railcars, and marine vessels whose collection systems are connected to the affected facilities vapor collection systems.

(h) The owner or operator of an affected facility shall ensure that the vapor collection and benzene loading equipment of tank trucks and railcars shall be designed and operated to prevent gauge pressure in the tank truck or railcar tank from exceeding 4,500 pascals during loading. This level is not to be exceeded when measured by the procedures specified in § 61.304(d).

(i) The owner or operator of an affected facility shall ensure that no pressure-vacuum vent in the affected facility's vapor collection system for tank trucks and railcars shall begin to open at a system pressure less than 4,500 pascals.

(j) The owner or operator of an affected facility shall ensure that the maximum normal operating pressure of the marine vessel's vapor collection equipment shall not exceed 0.5 times the relief set pressure of the pressure-vacuum vents. This level is not to be exceeded when measured by the procedures specified in § 61.304(e).

(k) Each calendar month, the owner or operator of an affected facility shall inspect the vapor collection system and the control device during the loading of tank trucks, railcars, or marine vessels for benzene leaks using Method 21 as described in § 61.304(g). A reading of

10,000 ppm or greater as methane shall constitute a leak. The owner or operator of the affected facility shall record each leak on the inspection form and repair the source of the leak within 15 calendar days after it is detected.

(l) Any owner or operator of an affected facility subject to this section may apply to the Administrator for a determination of an alternative means of emission limitation that achieves the reduction required by § 61.302(b).

§ 61.303. Monitoring requirements.

(a) Each owner or operator of an affected facility that uses an incinerator to comply with the percent reduction requirement specified under § 61.302(b) shall install, calibrate, maintain, and operate the following equipment according to manufacturer's specifications:

(1) A temperature monitoring device equipped with a continuous recorder and having an accuracy of ± 1 percent of the combustion temperature being measured expressed in degrees Celsius or ± 0.5 °C, whichever is greater.

(i) Where an incinerator other than a catalytic incinerator is used, the owner or operator of the affected facility shall install a temperature monitoring device in the firebox.

(ii) Where a catalytic incinerator is used, the owner or operator shall install temperature monitoring devices in the gas stream immediately before and after the catalyst bed.

(2) A flow indicator installed, calibrated, maintained, and operated according to manufacturer's specifications that provides a record of vent stream flow to the incinerator during the entire loading cycle. The owner or operator shall install the flow indicator in each vent stream at a point closest to the inlet of each incinerator.

(b) Each owner or operator of an affected facility that uses a flare to comply with § 61.302(b) shall install, calibrate, maintain, and operate the following equipment according to manufacturer's specifications:

(1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light to indicate the presence of a flame during the entire loading cycle.

(2) A flow indicator that provides a record of vent stream flow to the flare during the entire loading cycle. The owner or operator shall install the flow indicator in the vent stream at a point closest to the inlet of each flare.

(c) Each owner or operator of an affected facility that uses a steam generating unit or process heater to comply with § 61.302(b) shall comply with the following requirements. Where

a steam generating unit or process heater with a design heat input capacity of 44 MW or greater is used to comply with § 61.302(b), the owner or operator of an affected facility shall comply with paragraphs (c)(1) and (c)(3). Where a steam generating unit with a design heat input capacity of less than 44 MW is used to comply with § 61.302(b), the owner or operator of an affected facility shall comply with paragraphs (c)(1) and (c)(2).

(1) Install, calibrate, maintain, and operate according to the manufacturer's specifications, a flow indicator that provides a record of vent stream flow to the steam generating unit or process heater during the entire loading cycle. The owner or operator shall install the flow indicator in the vent stream at a point closest to the inlet to each steam generating unit or process heater.

(2) Install in the firebox, calibrate, maintain, and operate according to manufacturer's specifications a temperature monitoring device equipped with a continuous recorder and having an accuracy of ± 1 percent of the temperature being measured expressed in degrees Celsius or ± 0.5 °C, whichever is greater, for steam generating units or process heaters of less than 44 MW design heat input capacity.

(3) Monitor and record the periods of operation of the steam generating units or process heater if the design heat input capacity of the steam generating unit or process heater is 44 MW or greater. The records must be readily available for inspection.

(d) Each owner or operator of an affected facility that uses a carbon adsorption system to comply with the percent reduction requirement specified under § 61.302(b) shall carry out the monitoring provisions of paragraph (d)(1) of this section and either paragraph (d)(2) or (d)(3) of this section, as appropriate.

(1) Install, calibrate, maintain, and operate according to the manufacturer's specifications, a flow indicator that provides a record of vent stream flow to the carbon adsorber during the entire loading cycle. The owner or operator shall install the flow indicator in the vent stream at the point closest to the inlet to each carbon adsorber.

(2) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, install, calibrate, maintain, and operate, according to the manufacturer's specifications, a monitoring device that continuously indicates and records the concentration level of benzene in either the control device outlet gas stream or in both the control device inlet and outlet

gas streams. The outlet gas stream shall be monitored if the percent increase in the concentration level of benzene is used as the basis for reporting, as described in § 61.305(b)(5). The inlet and outlet gas streams shall be monitored if the percent control device efficiency is used as the basis for reporting, as described in § 61.305(b)(6).

(3) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, install, calibrate, maintain, and operate, according to the manufacturer's specifications, a monitoring device that indicates and records the concentration level of benzene in the outlet gas stream for a minimum of one complete adsorption cycle per day for each adsorber vessel. The owner or operator may also monitor and record the concentration level of benzene in the common carbon adsorption system inlet gas stream or in each individual carbon adsorber vessel inlet stream. The outlet gas streams shall be monitored if the percent increase in the concentration level of benzene is used as the basis for reporting, described in § 61.305(b)(5). In this case, the owner or operator of an affected facility shall compute daily a 3-day rolling average concentration level of benzene in the outlet gas stream from each individual adsorber vessel. The inlet and outlet gas streams shall be monitored if the percent control device efficiency is used as the basis for reporting, as described in § 61.305(b)(6). In this case, the owner or operator shall compute daily a 3-day rolling average efficiency for each individual adsorber vessel.

(e) The owner or operator of an affected facility seeking to demonstrate compliance with the standards specified under § 61.302(b) with control devices other than an incinerator, steam generating unit, process heater, carbon adsorber, or flare shall provide the Administrator with information describing the operation of the control device and the process parameter(s) that would indicate proper operation and maintenance of the device. The Administrator may request further information and will specify appropriate monitoring procedures or requirements.

(f) Each owner or operator of an affected facility seeking to comply with § 61.302(e)(1) shall install, calibrate, maintain, and operate a recording pressure measurement device (magnehelic gauge or equivalent device) and an audible and visible alarm system that is activated where the pressure vacuum specified in § 61.302(e)(1) is not attained. The owner or operator shall place the alarm system so that it can be

seen and heard where cargo transfer is controlled and on the open deck.

§ 61.304 Test methods and procedures:

(a) The procedures for determining compliance with § 61.302(b) for all control devices other than flares is as follows:

(1) All testing equipment shall be prepared and installed as specified in the appropriate test methods.

(2) The time period for a performance test shall be not less than 6 hours, during which at least 300,000 liters of benzene are loaded. If the throughput criterion is not met during the initial 6 hours, the test may be either continued until the throughput criterion is met, or resumed the next day with at least another 6 complete hours of testing.

(3) For intermittent control devices:

(i) The vapor holder level of the intermittent control device shall be recorded at the start of the performance test. The end of the performance test shall coincide with the time when the vapor holder is at its original level.

(ii) At least two startups and shutdowns of the control device shall occur during the performance test. If this does not occur under automatically controlled operation, the system shall be manually controlled.

(4) An emission testing interval shall consist of each 5-minute period during the performance test. For each interval:

(i) The reading from each measurement instrument shall be recorded.

(ii) Method 1 or 1A of part 60, Appendix A, as appropriate, shall be used for selection of the sampling site.

(iii) The volume exhausted shall be determined using Method 2, 2A, 2C, or 2D of part 60, Appendix A, as appropriate.

(iv) The average benzene concentration upstream and downstream of the control device in the vent shall be determined using Method 25A or Method 25B of part 60, Appendix A using benzene as the calibration gas. The average benzene concentration shall correspond to the volume measurement by taking into account the sampling system response time.

(5) The mass emitted during each testing interval shall be calculated as follows:

$$M_i = FKV_s C$$

Where:

M_i = Mass of benzene emitted during testing interval i , kg.

V_s = Volume of air-vapor mixture exhausted, m^3 at standard conditions.

C = Benzene concentration (as measured) at the exhaust vent, ppmv.

K = Density, (kg/ m^3 benzene), standard conditions.

= 3.25 for benzene.

F = Conversion factor, (m^3 benzene/ m^3 air)(1/ppmv).

= 10^{-6} .

s = Standard conditions, 20°C and 760 mm-Hg.

(6) The benzene mass emission rates before and after the control device shall be calculated as follows:

$$E = \frac{\sum_{i=1}^n M_i}{T}$$

Where:

E = Mass flow rate of benzene emitted, kg/hr.

M_i = Mass of benzene emitted during testing interval i , kg.

T = Total time of all testing intervals, hr.

n = Number of testing intervals.

(7) The percent reduction across the control device shall be calculated as follows:

$$R = \frac{E_b - E_a}{E_b} (100)$$

Where:

R = Control efficiency of control device, %.

E_b = Mass flow rate of benzene prior to control device, kg/hr.

E_a = Mass flow rate of benzene after control device, kg/hr.

(b) When a flare is used to comply with § 61.302(b), a performance test according to Method 22 of part 60, Appendix A, shall be performed to determine visible emissions. The observation period shall be at least 2 hours and shall be conducted according to Method 22. Performance testing must be conducted during at least three complete loading cycles with a separate test run for each loading cycle. The observation period for detecting visible emissions should encompass each loading cycle. Integrated sampling to measure process vent stream flow rate should be performed continuously during each loading cycle.

(c) The maximum permitted velocity for flares complying with § 61.302(b) shall be 18.3 m/sec.

(d) For the purpose of determining compliance with § 61.302(h), the following procedures shall be used:

(1) Calibrate and install a pressure measurement device (liquid manometer, magnehelic gauge, or equivalent instrument), capable of measuring up to 500 mm of water with a precision of ± 2.5 mm H₂O.

(2) Connect the pressure measurement device to a pressure tap in the affected facility's vapor collection system, located as close as possible to the connection with the tank truck or railcar.

(3) During the performance test, record the pressure every five minutes

while a tank truck or railcar is being loaded, and record the highest instantaneous pressure that occurs during each loading cycle. Every loading rack must be tested at least once during the performance test.

(4) If more than one loading rack is used simultaneously, then the performance test should be conducted simultaneously to represent the maximum capacity.

(e) For the purpose of determining compliance with § 61.302(j), the following procedures shall be used:

(1) Calibrate and install a pressure measurement device (liquid manometer, magnehelic gauge, or equivalent instrument), capable of measuring up to the relief set pressure of the pressure-vacuum vents.

(2) Connect the pressure measurement device to a pressure tap in the affected facility's vapor collection system, located as close as possible to the connection with the marine vessel.

(3) During the performance test, record the pressure every five minutes while a marine vessel is being loaded, and record the highest instantaneous pressure that occurs during each loading cycle.

(f) Immediately prior to a performance test required for determination of compliance with § 61.302(b) all potential sources of vapor leakage in the affected facility's vapor collection system equipment shall be monitored for leaks using Method 21 as described in § 61.304(g). The monitoring shall be conducted only while a vapor tight tank truck, railcar, or marine vessel is being loaded. All identified leaks in the terminal's vapor collection system shall be repaired prior to conducting the performance test.

(g) Monitoring, as required in § 61.302(k), shall be conducted in accordance with the following requirements:

(1) Monitoring shall comply with Method 21 of 40 CFR Part 60, Appendix A.

(2) The detection instrument shall meet the performance criteria of Method 21.

(3) The instrument shall be calibrated before use on each day of its use by the procedures specified in Method 21.

(4) The calibration gas shall be methane.

(5) The instrument probe shall be traversed around all potential leak interfaces as close as possible to the interface as described in Method 21.

(h) The following test method shall be used to comply with the marine vessel vapor-tightness requirements of § 61.302(e)(3):

(1) Each benzene product tank shall be pressurized with dry air or inert gas to not less than 1.0 psig and not more than the pressure of the lowest relief valve setting.

(2) Once the pressure is obtained, the dry air or inert gas source shall be shut off.

(3) At the end of one-half hour, the pressure in the benzene product tank and piping shall be measured. The change in pressure shall be calculated using the following formula:

$$\Delta P = P_1 - P_r$$

Where:

ΔP = Change in pressure, inches of water.

P_1 = Pressure in tank when air/gas source is shut off, inches of water.

P_r = Pressure in tank at the end of one-half hour after air/gas source is shut off, inches of water.

(4) The change in pressure, ΔP , shall be compared to the pressure drop calculated using the following formula:

$$\Delta PM = 0.861 P_{1a} L/V$$

Where:

ΔPM = Maximum allowable pressure change, inches of water.

P_{1a} = Pressure in tank when air/gas source is shut off, inches of water, absolute.

L = Maximum permitted loading rate of vessel, barrels per hour.

V = Total volume of product tank, barrels.

(5) If $\Delta P < \Delta PM$, the vessel is vapor tight.

(6) If $\Delta P > \Delta PM$, the vessel is nonvapor tight and the source of the leak must be identified and repaired prior to retesting.

§ 61.305 Reporting and recordkeeping.

(a) Each owner or operator of an affected facility subject to the provisions of this subpart shall keep an up-to-date, readily accessible record of the following data measured during each performance test, and also include the following data in the report of the initial performance test required under § 61.13. Where a steam generating unit or process heater with a design heat input capacity of 44 MW or greater is used to comply with § 61.302(b), a report containing performance test data need not be submitted, but a report containing the information in § 61.305(a)(3)(i) is required.

(1) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with § 61.302(b) through use of an incinerator:

(i) The average firebox temperature of the incinerator (or the average temperature upstream and downstream of the catalyst bed), measured at least every 2 minutes during a loading cycle if

the total time period of the loading cycle is less than 3 hours and every 15 minutes if the total time period of the loading cycle is equal to or greater than 3 hours. The measured temperature shall be averaged over the loading cycle.

(ii) The percent reduction of benzene determined as specified in § 61.304(a) achieved by the incinerator.

(2) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with § 61.302(b) through use of a smokeless flare or flare design (i.e., steam-assisted, air-assisted or nonassisted), all visible emission readings, heat content determination, flowrate measurements, and exit velocity determinations made during the performance test, continuous records of the flare pilot flame monitoring measured continuously during the loading cycle and records of all loading cycles during which the pilot flame is absent for each vent stream:

(3) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with § 61.302(b) through the use of a steam generating unit or process heater:

(i) A description of the location at which the vent stream is introduced into the steam generating unit or process heater, and

(ii) The average combustion temperature of the steam generating unit or process heater with a design heat input capacity of less than 44 MW measured at least every 2 minutes during a loading cycle if the total time period of the loading cycle is less than 3 hours and every 15 minutes if the total time period of the loading cycle is equal to or greater than 3 hours. The measured temperature shall be averaged over the loading cycle.

(4) Where an owner or operator subject to the provisions of this subpart seeks to demonstrate compliance with § 61.302(b) through the use of a carbon adsorption system, the data listed under paragraphs (a)(4)(i) or (a)(4)(ii), as appropriate.

(i) For those affected facilities monitoring only the carbon adsorption system outlet concentration level of benzene the data specified in (a)(4)(i)(A) or (B), as applicable.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, the average benzene concentration level measured during three consecutive system rotations through the adsorption cycles of all the individual adsorber vessels.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, the average benzene concentration level measured on a 3-day rolling average for each adsorber vessel.

(ii) For those affected facilities

monitoring both the carbon adsorption system inlet and outlet concentration level of benzene, the data specified in (a)(4)(ii)(A) or (B), as applicable.

(A) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, the average control efficiency measured during three consecutive adsorption cycles.

(B) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, the average control efficiency measured on a 3-day rolling average.

(b) Each owner or operator subject to the provisions of this subpart shall keep up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored under § 61.303 (a), (c), and (d) as well as up-to-date, readily accessible records of periods of operation during which the parameter boundaries established during the most recent performance test are exceeded. The Administrator may at any time require a report of these data. Periods of operation during which the parameter boundaries established during the most recent performance tests are exceeded are defined as follows:

(1) For thermal incinerators, all loading cycles during which the average combustion temperature was more than 28 °C below the average combustion temperature during the most recent performance test at which compliance with § 61.302(b) was determined.

(2) For catalytic incinerators, all loading cycles during which the average temperature of the vent stream immediately before the catalyst bed is more than 28 °C below the average temperature of the process vent stream during the most recent performance test at which compliance with § 61.302(b) was determined.

(3) All loading cycles during which the average combustion temperature was more than 28 °C below the average combustion temperature during the most recent performance test at which compliance with § 61.302(b) was determined for steam generating units or process heaters with a design heat input capacity of less than 44 MW.

(4) For steam generating units or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone as required under § 61.302(b).

(5) For those affected facilities monitoring only the carbon adsorption system outlet concentration levels of benzene, the periods specified in paragraph (b)(5)(i) or (ii), as applicable.

(i) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, all periods

of three consecutive system rotations through the adsorption cycle of all the individual adsorber vessels during which the average benzene concentration in the common outlet gas stream is more than 20 percent greater than the average value measured during the most recent performance test that demonstrated compliance.

(ii) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, all 3-day rolling averages for each adsorber vessel when the benzene concentration level in the individual outlet gas stream is more than 20 percent greater than the average value for that adsorber vessel measured during the most recent performance test that demonstrated compliance.

(6) For those affected facilities monitoring the carbon adsorption system inlet and outlet concentration level of benzene, the data specified in paragraph (b)(6)(i) or (ii), as applicable.

(i) For carbon adsorption systems with a common exhaust stack for all the individual adsorber vessels, all periods of three consecutive adsorption cycles during which the average system control efficiency is below 95 percent.

(ii) For carbon adsorption systems with individual exhaust stacks for each adsorber vessel, all 3-day rolling averages for each adsorber vessel when the system control efficiency is below 95 percent.

(c) Each owner or operator of an affected facility subject to the provisions of this subpart shall keep up-to-date, readily accessible records of the indication of flow specified under §§ 61.303 (a)(2), (b)(2), (c)(1), and (d)(1), as well as up-to-date, readily accessible records of all periods when the vent stream is diverted from the control device during the loading cycle.

(d) Each owner or operator of an affected facility subject to the provisions of this subpart who uses a steam generating unit or process heater with a design heat input capacity of 44 MW or greater to comply with § 61.302(b) shall keep an up-to-date, readily accessible record of all periods of operation of the steam generating unit or process heater. Examples of such records could include records of steam use, fuel use, or monitoring data collected pursuant to other State or Federal regulatory requirements.

(e) Each owner or operator of an affected facility subject to the provisions of this subpart shall keep up-to-date, readily accessible records of the flare pilot flame monitoring specified under § 61.303(b), as well as up-to-date, readily accessible records of any absence of the pilot flame during a loading cycle.

(f) Each owner or operator of an affected facility subject to the requirements of § 61.302 shall submit to the Administrator quarterly reports of the following information. The owner or operator shall submit the initial report within 90 days after the effective date of this subpart or 90 days after startup for a source that has an initial startup date after the effective date. If none of the following information is recorded for a quarter, no report for that quarter is required.

(1) Exceedances of monitored parameters recorded under § 61.305(b);

(2) All periods recorded under § 61.305(c) when the vent stream is diverted from the control device.

(3) All periods recorded under § 61.305(d) when the steam generating unit or process heater was not operating.

(4) All periods recorded under § 61.305(e) in which the pilot flame of the flare was absent.

(g) The owner or operator of an affected facility shall keep the vapor tightness documentation required under § 61.302 (d) and (e) on file at the affected facility in a permanent form available for inspection.

(h) The owner or operator of an affected facility shall update the documentation file required under § 61.302 (d) and (e) for each tank truck, railcar, or marine vessel at least once per year to reflect current test results as determined by the appropriate method. The owner or operator shall include, as a minimum, the following information in this documentation:

(1) Test title.

(2) Tank truck, railcar, or marine vessel owner and address.

(3) Tank truck, railcar, or marine vessel identification number.

(4) Testing location.

(5) Date of test.

(6) Tester name and signature.

(7) Witnessing inspector: name, signature, and affiliation.

(8) Test results.

(i) The owner or operator of an affected facility shall keep a record of each monthly leak inspection using Method 21 as required under § 61.304(g) on file at the affected facility for at least 2 years. The owner or operator shall include, as a minimum, the following information on each inspection record:

(1) Date of inspection.

(2) Findings (may indicate no leaks discovered; or location, nature and severity, i.e., Method 21 results of each leak).

(3) Corrective action taken (date each leak repaired, reasons for any repair interval in excess of 15 days).

(4) Inspector name and signature.

(j) Each owner or operator of an affected facility seeking to comply with § 61.300(b) or § 61.300(c) shall record the following information. The first year after promulgation, the owner or operator shall submit a report containing the requested information to the Director of the Emission Standards Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. After the first year, the owner or operator shall continue to record; however, no reporting is required. The information shall be made available if requested. The information shall include, as a minimum:

(1) The affected facility's name and address.

(2) The weight percent of the benzene loaded.

(3) The type of vessel loaded (i.e., tank truck, railcar, or marine vessel).

(4) The annual amount of benzene loaded into each type of vessel.

§ 61.306. Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under § 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: § 61.302(1).

5. Subpart CC is added as follows:

Subpart CC—National Emission Standard for Benzene Emissions From Gasoline Storage Vessels at Service Stations

Sec.

61.310 Applicability.

61.311 Definitions.

61.312 Standards.

61.313 Reporting and recordkeeping.

61.314 Delegation of authority.

Subpart CC—National Emission Standard for Benzene Emissions From Gasoline Storage Vessels at Service Stations

§ 61.310. Applicability.

(a) All gasoline storage vessels at service stations where the total annual throughput of the station is greater than or equal to 454,200 liters of gasoline are subject to all provisions of this subpart except § 61.313(b).

(b) Gasoline storage vessels located at service stations where the total annual throughput of the station is less than 454,200 liters are exempt from the requirements of this subpart except for the requirements of § 61.313.

§ 61.311 Definitions.

Terms used in this subpart are defined in the Clean Air Act in Subpart A of this part or in this section as follows:

"Gasoline" means any petroleum distillate or petroleum distillate/alcohol blend having a Reid vapor pressure of 27.6 kilopascals or greater which is used as a fuel for internal combustion engines.

"Gasoline storage vessel" means each tank, reservoir, or container used for the storage of gasoline but does not include:

(a) Frames, housing, auxiliary supports, or other components that are not directly involved in the containment of liquids or vapors, or

(b) Subsurface caverns or porous rock reservoirs.

"Gasoline tank truck" means a delivery tank truck used at a service station for the purpose of unloading gasoline.

"Service station" means any site where gasoline is dispensed to motor vehicle fuel tanks from stationary storage vessels, including retail facilities, fleet operations (i.e., rental car agencies, private companies, governmental agencies), parking garages, and bus operations.

"Submerged fill" means the method of filling a tank truck or storage vessel where product enters within 150 mm of the bottom of the tank truck or vessel. Bottom filling of tank trucks or storage vessels is included in this definition.

"Vapor balance system" means the equipment necessary to transfer vapors, displaced during the delivery of gasoline, to storage vessels at service stations, back into the gasoline tank truck.

"Vapor-tight" means equipment that allows no loss of vapors. Compliance with vapor-tight requirements can be determined by checking to ensure that the concentration at a potential leak source is not equal to or greater than 100 percent of the Lower Explosive Limit (LEL) when measured with a combustible gas detector, calibrated with propane, at a distance 2.54 cm from the source.

"Vapor-tight gasoline tank truck" means a gasoline tank truck that has demonstrated within the 12 preceding months that its product or delivery tank will sustain a pressure change of not more than 75 mm of water within 5 minutes after it is pressurized to 450 mm of water and evacuated to 150 mm of water. This capability is to be demonstrated using the test procedures specified in Reference Method 27 of Appendix A of 40 CFR part 60.

§ 61.312 Standards.

(a) Each owner or operator of a service station with a total annual

throughput equal to or greater than 4,542,000 liters shall be in compliance with the provisions of this section no later than [one year from date promulgated in Federal Register]. Owners or operators of service stations with annual throughputs less than 4,542,000 liters and greater than 454,200 liters shall be in compliance with the provisions of this section no later than [two years from date promulgated in the Federal Register].

(b) Each owner or operator of a service station, described in § 61.310(a), shall comply with the following requirements:

(1) All gasoline storage vessels at service stations shall be loaded by submerged fill.

(2) Vapor line closures that seal upon disconnect are required to assure transfer of displaced vapors to the gasoline tank truck and to prevent ground level emissions caused by improperly connecting the vapor return line to the gasoline storage vessel. Concentric couplers without closures that seal upon disconnect are required to have such closures on the vapor line connection to the coupler itself.

(3) A vapor balance system shall be installed with a vapor tight line from the gasoline storage tank to the gasoline tank truck. The system shall be designed such that the back pressure in the gasoline tank truck does not exceed 450 mm of water pressure or 150 mm of water vacuum.

(4) If a gauge well separate from the fill tube is used, it must be provided with a submerged drop tube that extends to within 150 mm of the gasoline storage vessel bottom.

(5) Vapor tight caps are required for the liquid fill connection for all systems. A positive closure utilizing a gasket or other similar sealing surface is necessary to prevent vapors from being emitted at ground level.

(6) A device which restricts vapor flow from the vent pipe must be installed. Acceptable devices are:

(i) An orifice of 13mm to 19mm, or
(ii) A pressure vacuum relief valve set to open at no less than 450 mm of water or greater pressure and 150mm of water or greater vacuum.

(c) The owner or operator of the service station shall not allow the unloading of a gasoline tank truck to a gasoline storage vessel unless the following conditions are met:

(1) All hoses in the vapor balance system are properly connected. Acceptable means of providing this assurance include:

(i) An interlock which prevents gasoline unloading unless the vapor hose is connected, such as a bracket to

which the product and vapor hose are permanently attached so that neither hose can be connected separately, or

(ii) A closure in the vapor hose which remains closed unless the hose is attached to the vapor fitting on the truck.

(2) All hatches on the gasoline tank truck are closed and securely fastened.

(3) The filling of storage vessels at service stations shall be limited to unloading by vapor-tight gasoline tank trucks. The owner or operator of the service station shall check the vapor tightness documentation for each gasoline tank truck prior to unloading at the facility. This documentation should show that the delivery truck has met the specifications of Method 27.

§ 61.313 Reporting and recordkeeping.

(a) All owners and operators of service stations subject to the provisions of this subpart shall comply with paragraphs (a)(1), (2), and (6) of § 61.10 of the general provisions of this part. No other provisions of § 61.10 are applicable to this subpart.

(b) All service stations described in § 61.310(b) shall maintain records showing the quantity of all gasoline delivered to the site. These records shall be retained for at least 2 years.

§ 61.314 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under Section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: No restrictions.

6. Subpart DD is added as follows:

Subpart DD—National Emission Standard for Benzene Emissions From Bulk Gasoline Terminals

Sec.

61.320 Applicability.

61.321 Definitions.

61.322 Standards: Loading racks at bulk gasoline terminals.

61.323 Standards: Gasoline storage vessels at bulk gasoline terminals.

61.324 Test methods and procedures.

61.325 Alternative means of emission limitation for gasoline storage vessels.

61.326 Monitoring of operations.

61.327 Reporting and recordkeeping requirements.

61.328 Delegation of authority.

Subpart DD—National Emission Standard for Benzene Emissions From Bulk Gasoline Terminals

§ 61.320 Applicability.

The provisions of this subpart apply to all loading racks at bulk gasoline terminals which deliver liquid product into gasoline tank trucks and all gasoline storage vessels at bulk gasoline terminals.

§ 61.321 Definitions.

As used in this subpart, all terms shall have the meaning given them in the Clean Air Act, in Subpart A, Subparts Kb and XX of part 60, or in Subpart A of this part. Terms defined in both Subpart A of part 60 and Subpart A of this part shall have the meaning given in Subpart A of this part. For purposes of this subpart, terms defined in this section supercede definitions used in other subparts.

"Existing vapor processing system" means a vapor processing system capable of achieving emissions to the atmosphere no greater than 80 milligrams of total organic compounds per liter of gasoline loaded, the construction or refurbishment of which was commenced before September 14, 1989, and which was not constructed or refurbished after that date.

"Fill" means the introduction of gasoline into a gasoline storage vessel but not necessarily to complete capacity.

"Gasoline storage vessel" means each tank, reservoir, or container used for the storage of gasoline but does not include: (a) Frames, housing, auxiliary supports, or other components that are not directly involved in the containment of liquids or vapors, or (b) Subsurface caverns or porous rock reservoirs. "Volatile organic liquid (VOL)", for the purposes of this subpart, means gasoline.

§ 61.322 Standards: Loading racks at bulk gasoline terminals.

(a) Each owner or operator of loading racks at bulk gasoline terminals shall comply with the Standard for Volatile Organic Compound Emissions from Bulk Gasoline Terminals contained in 40 CFR 60.502, except paragraphs (b) and (c) of that section. For purposes of this section, the term "affected facility" used in § 60.502 shall mean the loading racks at bulk gasoline terminals referred to in § 61.320.

(b) The emissions to the atmosphere from the vapor collection system due to the loading of liquid product into gasoline tank trucks shall not exceed 0.2 milligrams of benzene per liter of gasoline loaded. Each owner or operator

of loading racks at bulk gasoline terminals shall comply with these limits no later than [one year from date promulgated in Federal Register], except as noted in paragraph (c) of this section.

(c) Each source equipped with an existing vapor processing system shall comply with the requirements of paragraph (b) of this section no later than December 31, 1992.

§ 61.323 Standards: Gasoline storage vessels at bulk gasoline terminals.

The owner or operator of each gasoline storage vessel at bulk gasoline terminals shall comply with the requirements of 40 CFR 60.112B no later than [one year from date promulgated in the Federal Register].

§ 61.324 Test methods and procedures.

(a) In conducting the performance tests required in § 61.13, the owner or operator shall use the test methods in Appendix A of 40 CFR Part 60 or other methods and procedures as specified in this section, except as provided in § 61.13. If a flare is used as a control device, the provisions of § 61.18(b) apply.

(b) Immediately before the performance test required to determine compliance with § 61.322 the owner or operator shall use Method 21 to monitor for leakage of vapor all potential sources in the terminal's vapor collection system equipment while a gasoline tank truck is being loaded. The owner or operator shall repair all leaks with readings of 10,000 ppm (as methane) or greater before conducting the performance test.

(c) The owner or operator shall determine compliance with the standards in § 61.322 as follows:

(1) The performance test shall be 6 hours long during which at least 300,000 liters of gasoline are loaded. If this is not possible, the test may be continued the same day until 300,000 liters of gasoline are loaded or the test may be resumed the next day with another complete 6-hour period. In the latter case, the 300,000-liter criterion need not be met. To the extent possible, testing shall be conducted during the 6-hour period in which the highest throughput normally occurs.

(2) If the vapor processing system is intermittent in operation, the performance test shall begin at a reference vapor holder level and shall end at the same reference point. The test shall include at least two startups and shutdowns of the vapor processor. If this does not occur under automatically controlled operations, the system shall be manually controlled.

(3) The emissions rate (E) of benzene shall be computed using the following equation:

$$E = K (V_E C_B) / (L_G 10^6)$$

Where:

E = Emission rate of benzene, mg of benzene/liter of gasoline loaded.

V_E = Volume of air-vapor mixture exhausted, scm.

C_B = Concentration of benzene in the integrated bag, ppm.

L_G = Total volume of gasoline loaded, liters.

K = Density of calibration gas (3.24×10^6 mg/scm for benzene).

(4) The sample shall be collected as specified in paragraph (6) of this section into one integrated bag for the entire test period. From this bag the benzene concentration (C_B) shall be determined.

(5) The following methods shall be used to determine the volume (V) of air-vapor mixture exhausted at each interval:

(i) Method 2B shall be used for combustion vapor processing systems.

(ii) Method 2A shall be used for all other vapor processing systems.

(6) Method 18 shall be used for determining the benzene concentration (C_B). Follow Section 7.1 of Method 18 for the integrated bag sampling procedures, except use an initial flow rate of 0.2 liter/minute. Take particular care to keep the sampling rate at a constant proportion to the stack velocity or flow rate. Stop the sample pump whenever there is no stack flow. To determine benzene concentration, use a separation column constructed of stainless steel, 1.83m by 3.2mm, containing 10 percent 1,2,3-tris (2-cyanoethoxy) propane (TECP) on 80/100 mesh Chromosorb P AW. Set the column temperature at 80 °C and the detector temperature at 225 °C. A flow rate of approximately 20 mL/min should produce adequate separations. The analyst may use other columns, provided that the precision and accuracy of the analysis of benzene standards are not impaired, and the analyst has available for review information confirming that there is adequate resolution of the benzene peak. Adequate resolution is defined as an area overlap of not more than 10 percent of benzene peak by an interfering peak. Calculation of area overlap is explained in Part 61, Appendix C, Procedure 1: "Determination of Adequate Chromatographic Peak Resolution". In lieu of preparation of benzene standards as described in Section 5 of Method 18, use commercially prepared benzene standards that are commensurate with the calibration gases specified in Part

61, Appendix B, Method 106, Section 5.2.3.

(7) To determine the volume (L_c) of gasoline dispensed during the performance test period at all loading racks whose benzene emissions are controlled by the processing system being tested, terminal records or readings from gasoline dispensing meters at each loading rack shall be used.

(d) The owner or operator shall determine compliance with the back pressure requirements of § 61.322 as follows:

(1) A pressure measurement device (liquid manometer, magnehelic gauge, or equivalent instrument), capable of measuring up to 500 mm of water gauge pressure with ± 2.5 mm of water precision, shall be calibrated and installed on the terminal's vapor collection system at a pressure tap located as close as possible to the connection with the gasoline tank truck.

(2) During the performance test, the pressure shall be recorded every 5 minutes while a gasoline truck is being loaded; the highest instantaneous pressure that occurs during each loading shall also be recorded. Every loading position shall be tested at least once during the performance test.

(e) The owner or operator of each gasoline storage vessel located at a bulk gasoline terminal subject to § 61.323 shall meet the requirements of 40 CFR 60.113b.

§ 61.325 Alternative means of emission limitation for gasoline storage vessels.

For determining the acceptance of alternative means of emission limitation, the provisions of 40 CFR 60.146 shall apply.

§ 61.326 Monitoring of operations.

The owners or operators of storage vessels at bulk gasoline terminals subject to the provisions of this subpart shall comply with the monitoring of operations requirements set forth in 40 CFR 60.116b.

§ 61.327 Reporting and recordkeeping requirements.

(a) In addition to the reporting requirements in the general provisions of this part, all owners or operators shall provide written notification to the Administrator stating the intention to refurbish an existing control device or install a new control device no later than 30 days prior to the refurbishment or installation of such device. Once the refurbishment or installation is complete, emission test notification procedures described in the general provisions shall apply.

(b) All owners and operators of sources subject to the provisions of this subpart shall comply with paragraphs (a)(1), (2), (6) and (b) of § 61.10 of the general provisions of this part. No other provisions of § 60.10 are applicable to this subpart.

(c) All owners and operators of loading racks at bulk gasoline terminals subject to the provisions of this subpart shall keep records and furnish reports as specified in 40 CFR 60.505.

(d) All owners or operators of gasoline storage vessels subject to the provisions of this subpart shall keep records and furnish reports as specified in 40 CFR 60.115b.

§ 61.328 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: § 61.325 Alternative means of emission limitation for gasoline storage vessels.

7. Subpart EE is added as follows:

Subpart EE—National Emission Standard for Benzene Emissions From Unloading, Loading, and Storage Operations at Bulk Gasoline Plants

Sec.

61.330 Applicability.

61.331 Definitions.

61.332 Standards.

61.333 Reporting and recordkeeping.

61.334 Delegation and authority.

Subpart EE—National Emission Standard for Benzene Emissions From Unloading, Loading, and Storage Operations at Bulk Gasoline Plants

§ 61.330 Applicability.

The provisions of this subpart apply to all unloading, loading, and storage operations at bulk gasoline plants.

§ 61.331 Definitions.

As used in this subpart, all terms shall have the meaning given them in the Clean Air Act, in Subpart A or Subpart XX of 40 CFR Part 60, or in Subpart A of this part. Terms defined in both Subpart A of Part 60 and Subpart A of this part shall have the meaning given in Subpart A of this part. Terms defined in this section supercede definitions used in other subparts.

"Bulk gasoline plant" means any gasoline distribution facility that is used for the storage and distribution of gasoline by gasoline tank truck and has a gasoline throughput less than or equal to 76,000 liters per day. Gasoline

throughput shall be the maximum calculated design throughput as may be limited by compliance with an enforceable condition under Federal requirement, State or local law, and discoverable by the Administrator or any other person.

"Gasoline tank truck" means a delivery tank truck used at bulk gasoline plants which is loading gasoline or which has loaded gasoline on the immediately previous load.

"Submerged fill" means the method of filling a tank truck or storage vessel where product enters within 150 mm of the bottom of the tank truck or vessel. Bottom filling of tank trucks or storage vessels is included in this definition.

"Vapor balance system" means a closed system which will allow the balancing of vapors between the storage vessel and the gasoline tank truck during loading or unloading of gasoline.

"Vapor-tight" means equipment that allows no loss of vapors. Compliance with vapor-tight requirements can be determined by checking to ensure that the concentration is not equal to or greater than 100 percent of the Lower Explosive Limit (LEL) when measured with a combustible gas detector, calibrated with propane, at a distance 2.54 cm from the source.

§ 61.332 Standards.

(a) Each bulk plant shall be equipped with a vapor balance system between the gasoline storage vessel and the incoming gasoline tank truck, designed to capture vapors displaced during filling of the gasoline storage vessel. These lines shall be equipped with fittings which are vapor tight and automatically and immediately close upon disconnection.

(b) For bulk gasoline plants with an annual gasoline tank truck loading throughput greater than or equal to 4,542,000 liters, each bulk plant shall be equipped with a vapor balance system between the gasoline storage vessel and the outgoing gasoline tank truck designed to capture vapors displaced during the loading of the gasoline tank truck. This vapor balance system shall be designed to prevent any vapors collected at one loading rack from passing to another loading rack.

(c) For bulk gasoline plants with an annual gasoline tank truck loading throughput less than 4,542,000 liters, loading of outgoing gasoline tank trucks shall be restricted to the use of submerged fill.

(d) Owners or operators of bulk plants required to meet the provisions of paragraphs (a) and (b) of this section must comply by [one year from date of

promulgation in Federal Register]. Owners or operators of bulk plants required to meet the provisions of paragraphs (a) and (c) of this section must comply by [two years from date of promulgation in Federal Register].

(e) The bulk plant owner or operator shall act to assure that the vapor balance system, required by paragraphs (a) and (b) of this section, shall be connected between the tank truck and the storage vessel during gasoline transfer operations.

(f) All storage vessel openings, including inspection hatches and gauging and sampling devices, shall be vapor-tight when not being used.

(g) The gasoline tank truck compartment hatch covers shall not be opened during the gasoline transfer, except as allowed by paragraph (c).

(h) All vapor balance systems at bulk plants shall be designed and operated at all times to prevent gauge pressure in the gasoline tank truck from exceeding 450 mm of water and vacuum from exceeding 150 mm of water during product transfers.

(i) A pressure measurement device (liquid manometer, magnehelic gauge, or equivalent instrument), capable of measuring 500 mm of water gauge pressure with a ± 2.5 mm of water precision, shall be calibrated and installed on the bulk plant vapor balance system at a pressure tap, located as close as possible to the connection with the gasoline tank truck, to allow determination of compliance with paragraph (h) of this section.

(j) Each calendar month, the vapor balance systems described in § 61.332 (a) and (b), and each loading rack handling gasoline shall be inspected for liquid or vapor leaks during gasoline transfer operations. For purposes of this paragraph, detection methods incorporating sight, sound, or smell are acceptable. Each detection of a leak shall warrant the repair of the leak within 15 calendar days after it is detected.

(k) Filling of storage vessels shall be restricted to the use of submerged fill.

(l) No pressure-vacuum relief valve in the bulk plant vapor balance system shall begin to open at a system pressure less than 450 mm of water, or at a vacuum of 150 mm of water.

(m) The bulk plant owner/operator shall assure that all product transfers involving gasoline tank trucks at bulk plants, equipped with a vapor balance system required by paragraphs (a) and (b) of this section, shall be limited to vapor-tight gasoline tank trucks.

§ 61.333 Reporting and recordkeeping.

(a) All owners and operators of bulk gasoline plants subject to the provisions of this subpart shall comply with paragraphs (a) (1), (2), and (6) of § 61.10 of the general provisions of this part. No other provisions of § 61.10 are applicable to this subpart.

(b) All bulk plants that comply with the requirements described in § 61.332(c) shall maintain records showing the quantity of all gasoline loaded into gasoline tank trucks. These records shall be kept on file for 2 years.

(c) A record of each monthly leak inspection required under § 61.332(j) shall be kept on file at the plant for at least 2 years. Inspection records shall include, as a minimum, the following information:

- (1) Date of Inspection.
- (2) Findings (may indicate no leaks discovered; or location, nature, and severity of each leak).
- (3) Leak determination method.
- (4) Corrective Action (date each leak repaired; reasons for any repair interval in excess of 15 days).
- (5) Inspector Name and Signature.

§ 61.334 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: No restrictions.

8. Subpart FF is added as follows:

Subpart FF—National Emission Standard for Benzene Waste Operations

Sec.

- 61.340 Applicability.
- 61.341 Definitions.
- 61.342 Standards: General.
- 61.343 Standards: Tanks.
- 61.344 Standards: Surface impoundments.
- 61.345 Standards: Containers.
- 61.346 Standards: Individual drain systems.
- 61.347 Standards: Oil-water separators.
- 61.348 Standards: Treatment processes.
- 61.349 Standards: Closed vent systems and control devices.
- 61.350 Standards: Delay of repair.
- 61.351 Alternative standards for tanks.
- 61.352 Alternative standards for oil-water separators.
- 61.353 Alternative means of emission limitation.
- 61.354 Monitoring of operations.
- 61.355 Test methods, procedures, and compliance provisions.
- 61.356 Recordkeeping requirements.
- 61.357 Reporting requirements.
- 61.358 Delegation of authority.

Subpart FF—National Emission Standard for Benzene Waste Operations

§ 61.340 Applicability.

(a) The provisions of this subpart apply to each facility that generates, treats, stores, or disposes of waste that contains benzene.

§ 61.341 Definitions.

"Benzene concentration" means the fraction by weight of benzene in a waste as measured by one of the test methods identified in § 61.355.

"Closed vent system" means a system that is not open to the atmosphere and is composed of piping, connections, and, if necessary, flow inducing devices that transport gas or vapor from an emission source to a control device.

"Completely closed drain system" means an individual drain system that is equipped and operated with a closed vent system and control device complying with the requirements of § 61.349.

"Container" means any portable waste management unit in which a material is stored, transported, treated, or otherwise handled. Examples of containers are drums, barrels, tank trucks, barges, dumpsters, tank cars, dump trucks, and ships.

"Control device" means an enclosed combustion device, vapor recovery system, or flare.

"Cover" means an enclosure that is applied to an open area of a waste management unit to enclose and seal the waste surface in the management unit to form a closed system to contain air emissions. A cover may contain openings such as hatches and sample and gauge wells that are also sealed to contain emissions. Examples of covers include a fixed roof applied to a tank, an air supported enclosure installed over a surface impoundment, and a lid placed on a drum or dumpster.

"External floating roof" means a pontoon-type or double-deck type cover with certain rim sealing mechanisms that rests on the liquid surface in a waste management unit with no fixed roof.

"Facility" means all waste management units within a stationary source that are used for treatment, storage, or disposal of waste that contains benzene.

"Fixed roof" means a cover that is mounted on a waste management unit in a stationary manner and that does not move with fluctuations in liquid level.

"Floating roof" means a cover with certain rim sealing mechanisms consisting of a double deck, pontoon

single deck, internal floating cover or covered floating roof, which rests upon and is supported by the liquid being contained and is equipped with a closure seal or seals to close the space between the roof edge and unit wall.

"Individual drain system" means all process drains together with their associated sewer lines and junction boxes down to a waste management unit.

"Internal floating roof" means a roof that rests or floats on the liquid surface inside a waste management unit that has a fixed roof.

"Liquid-mounted seal" means a foam or liquid-filled primary seal mounted in contact with the liquid between the waste management unit wall and the floating roof continuously around the circumference.

"Loading" means the introduction of waste into a waste management unit but not necessarily to complete capacity (also referred to as filling).

"No detectable emissions" means less than 500 parts per million by volume (ppmv) above background levels, as measured by a detection instrument in accordance with Method 21 in Appendix A of 40 CFR part 60.

"Oil-water separator" means a waste management unit used to separate oil from water consisting of a separation tank, which also includes the forebay and other separator basins, skimmers, weirs, grit chambers, and sludge hoppers.

"Sewer line" means a lateral, trunk line, branch line, ditch, channel, or other conduit used to convey waste to a downstream waste management unit.

"Submerged fill" means the loading of waste into a container by positioning the end of the fill pipe within two fill-pipe diameters of the bottom of the container or beneath the surface of the material in the container to avoid splashing.

"Surface impoundment" means a waste management unit which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or waste containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.

"Tank" means a stationary waste management unit designed to contain an accumulation of waste which is constructed primarily of non-earthen materials (e.g., wood, concrete, steel, plastic) which provide structural support.

"Treatment process" means a steam stripper, thin-film evaporator, or waste incinerator.

"Vapor-mounted seal" means a foam-filled primary seal mounted continuously around the perimeter of a waste management unit so there is an annular vapor space underneath the seal. The annular vapor space is bounded by the bottom of the primary seal, the unit wall, the liquid surface, and the floating roof.

"Waste" means any material resulting from industrial, commercial, mining or agricultural operations, or from community activities that is discarded or is being accumulated, stored, or physically, chemically, thermally, or biologically treated prior to being discarded, recycled, or discharged.

"Waste management unit" means a piece of equipment, structure, or transport mechanism used in the handling, storage, treatment, or disposal of waste. Examples of waste management units include each tank, surface impoundment, container, oil-water separator, individual drain system, and treatment process.

"Waste stream" means waste generated by a particular process or piece of equipment.

§ 61.342 Standards: General.

(a) To comply with the provisions of this subpart, the owner or operator shall comply with the provisions of paragraphs (b) and (c) of this section unless the owner or operator seeks to qualify for an exemption from the control requirements in §§ 61.342 through 61.353 by one of the following:

(1) A determination using the procedures in § 61.355(b) that the total quantity of waste that contains benzene generated or managed at the facility is less than 10 Mg/yr. For these facilities, the owner or operator shall comply with the recordkeeping requirements of § 61.356.

(2) A determination using the procedures in § 61.355(c) that the total annual quantity of benzene in the waste managed at the facility is less than 10 Mg/yr. For these facilities, except as provided in paragraph (a)(3) of this section, the owner or operator shall comply with the recordkeeping and reporting requirements in §§ 61.356 and 61.357 and shall repeat the determination of total annual quantity of benzene in the waste at the frequency specified in § 61.355(k).

(3) A determination using the procedures in § 61.355(c) that the total annual quantity of benzene in the waste is less than 1 Mg/yr. For these facilities, the owner or operator shall comply with the recordkeeping requirements of

§ 61.356 and shall repeat the determination of total annual quantity of benzene in the waste when there is a change in the process that generates the waste, if that change could cause an increase in the total annual quantity of benzene in the waste.

(4) Where the total annual quantity of benzene in the waste at a facility is 10 Mg/yr or more, a determination that an individual waste stream has a benzene concentration less than 10 parts per million by weight (ppmw) as determined by the procedures in § 61.355(d). For these waste streams, the owner or operator shall comply with the recordkeeping and reporting requirements in §§ 61.356 and 61.357 and repeat the determination of benzene concentration at the frequency specified in § 61.355(d).

(b) Except as provided in paragraph (c) of this section, if an owner or operator elects not to seek an exemption from the control requirements of §§ 61.342 through 61.353, or where the total annual quantity of benzene in the waste at the facility is determined to be 10 Mg/yr or more and the benzene concentration of a waste stream is 10 ppmw or more, the owner or operator shall comply with the following:

(1) The owner or operator shall install and operate a steam stripper, thin-film evaporator, or waste incinerator to reduce, remove or destroy benzene in the waste stream and shall comply with requirements of § 61.348.

(2) As an alternative to paragraph (b)(1) of this section, an owner or operator may elect to demonstrate that an alternative control device(s) or treatment process(s) achieves a mass emission reduction of 99 percent for benzene in the waste stream and shall comply with the requirements of § 61.353.

(3) Except as provided in §§ 61.351 through 61.353, the owner or operator shall comply with the requirements in §§ 61.342 through 61.350 for each new and existing waste management unit located upstream of the treatment process.

(4) All recovered materials containing benzene shall be collected, stored, recycled, reused, or disposed of in a closed system. Each waste management unit used to handle the recovered material shall comply with the requirements in §§ 61.342 through 61.353. Once the recovered material is returned back to a process unit, it is no longer within the scope of this subpart.

(5) Any waste management unit located downstream of the treatment process required in paragraph (b)(1) of this section or downstream from an

equivalent alternative in paragraph (b)(2) of this section shall be exempt from the requirements of this subpart.

(c) If waste is shipped offsite for treatment or disposal, owners and operators shall comply with the following:

(1) Each owner or operator shall comply with the requirements in §§ 61.343 to 61.347 and § 61.349 for all waste management units handling waste that contains benzene.

(2) The owner or operator shall provide written notification to the offsite treatment or disposal facility that the waste is required to meet the provisions of this subpart.

(3) The owner or operator shall maintain documentation showing the name and location of the facility to which the waste is shipped and a copy of the written notification to the offsite treatment or disposal facility.

(d) Each owner or operator who treats a waste to comply with the requirements of paragraph (b)(1) or (b)(2) of this section, shall complete the waste treatment within 6 months from the time the waste is generated, or shall demonstrate to the Administrator why the waste treatment could not be completed within that time period.

(e) Compliance with this subpart will be determined by review of records and performance test results, and inspection using methods and procedures specified in § 61.355.

(f) Permission to use an alternative means of compliance to meet the requirements of §§ 61.342 through 61.352 may be granted as provided in § 61.353.

§ 61.343 Standards: Tanks.

(a) Except as provided in § 61.351, each tank subject to the requirements of this subpart shall be equipped and operated with a fixed roof and closed vent system that routes the vented stream to a control device that meets the requirements of § 61.349.

(b) The fixed roof shall enclose and seal the waste surface in the tank to form a closed system to contain the emissions.

(c) If the fixed roof has any openings (e.g., access doors, hatches, etc.), all such openings shall be sealed (e.g., gasketed, latched, etc.) and kept closed at all times when any wastes are in the tank, except during inspection and maintenance.

(d) The fixed roof and all openings shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during initial and quarterly inspections by the methods specified in § 61.355.

(e) Roof seals, access doors and other openings shall be checked by visual inspection initially and quarterly thereafter to ensure that no cracks or gaps occur between the roof and tank wall and that access doors and other openings are closed and gasketed properly.

(f) Except as provided in § 61.350, when a broken seal or gasket or other problem is identified, or when detectable emissions are measured, first efforts at repair shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.344 Standards: Surface Impoundments.

(a) Each surface impoundment subject to the requirements of this subpart shall be equipped and operated with one of the following:

(1) An air-supported enclosure and closed vent system that routes the vented stream to a control device that meets the requirements of § 61.349; or

(2) A rigid enclosure and closed vent system that routes the vented stream to a control device that meets the requirements of § 61.349.

(b) The enclosure shall enclose and seal the waste surface in the impoundment to form a closed system to contain emissions.

(c) If the enclosure has any openings, all such openings shall be sealed and kept closed at all times when any wastes are in the surface impoundment, except during inspection and maintenance or when it is necessary to dredge the impoundment.

(d) The enclosure and all openings shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during initial and quarterly inspections by the methods specified in § 61.355.

(e) Enclosure seals, access doors, and other openings shall be checked by visual inspection initially and quarterly thereafter to ensure that no cracks or gaps occur and that access doors and other openings are closed and gasketed properly.

(f) Except as provided in § 61.350, when a broken seal or gasket or other problem is identified, or when detectable emissions are measured, first efforts at repair shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.345 Standards: Containers.

(a) Each container subject to the requirements of this subpart shall be equipped and operated with a cover, except as provided in paragraph (b) of this section.

(1) Covers on containers shall be closed at all times except when it is necessary to add or remove waste and during inspection and maintenance.

(2) The cover shall enclose and seal the waste in the container to form a closed system to contain air emissions.

(3) All openings (e.g., bungs, hatches, etc.) shall be kept in a closed position and sealed at all times, except when it is necessary to add or remove waste and during inspection and maintenance.

(4) Loading of waste into a container shall be by submerged fill.

(i) The submerged fill pipe outlet shall extend to within two fill-pipe diameters of the bottom of the container or shall be kept beneath the surface of the waste in the container while the container is being loaded.

(ii) When a container is being loaded, only the area required for the loading inlet shall be open to the atmosphere.

(b) Any container used for treatment, including aeration, thermal or other treatment, shall be equipped with a closure device completely covering the container and a closed vent system that routes the vented stream to a control device that meets the requirements of § 61.349, or the container shall be placed inside an enclosure that is vented to a control device that meets the requirements of § 61.349.

(1) The cover or enclosure shall enclose and seal the waste surface in the container to form a closed system to contain emissions.

(2) If the cover or enclosure has any openings, they shall be sealed and kept closed at all times when any wastes are in the container, except during inspection and maintenance.

(3) The cover or enclosure and all openings shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during initial and quarterly inspections by the methods specified in § 61.355.

(c) Covers or enclosures and all openings shall be visually inspected initially and quarterly thereafter to ensure that they are closed and gasketed properly.

(d) Except as provided in § 61.350, when a broken seal or gasket or other problem is identified, first efforts at repair shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.346 Standards: Individual drain systems.

(a) Each individual drain system shall be operated as a completely closed drain system.

(b) Each completely closed drain system shall be equipped and operated with a closed vent system and control device complying with the requirements of § 61.349.

(c) Individual drain systems shall not be open to the atmosphere and shall be covered or enclosed with no visual gaps or cracks in joints, or seals.

(d) Each individual drain system shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during initial and quarterly inspections by the methods specified in § 61.355.

(e) Each individual drain system shall be visually inspected initially and quarterly thereafter for indication of cracks, gaps, or other problems that could result in benzene emissions.

(f) Except as provided in § 61.350, whenever cracks, gaps, or other problems are identified, or when detectable emissions are measured, repairs shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.347 Standards: Oil-water separators.

(a) Except as provided in § 61.352, each oil-water separator shall be equipped and operated with a fixed roof and closed vent system that routes the vented stream to a control device which meets the requirements of § 61.349.

(b) The fixed roof shall enclose and seal the waste surface in the oil-water separator to form a closed system to contain the emissions.

(c) If the fixed roof has any openings (e.g., access doors, hatches, etc.), all such openings shall be sealed (e.g., gasketed, latched, etc.) and kept closed at all times when any wastes are in the oil-water separator, except during inspection and maintenance.

(d) The fixed roof and all openings shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during initial and quarterly inspections by the methods specified in § 61.355.

(e) Roof seals, access doors and other openings shall be checked by visual inspection initially and quarterly thereafter to ensure that no cracks or gaps occur between the roof and the wall of the separator and that access doors and other openings are closed and gasketed properly.

(f) Except as provided in § 61.350, when a broken seal or gasket or other problem is identified, or when detectable emissions are measured, first efforts at repair shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.348 Standards: Treatment processes.

(a) Each steam stripper and thin-film evaporator shall comply with the following:

(1) Shall be installed and operated with a closed vent system and control device meeting the requirements of § 61.349.

(2) Shall be designed and operated to reduce the benzene concentration in the waste stream to less than 10 ppmw without the use of dilution as determined by the procedures in § 61.355.

(3) If compliance with § 61.342(b)(1) is achieved by multiple treatment processes in series, the benzene concentration in the waste stream exiting the last treatment process shall be reduced to less than 10 ppmw without the use of dilution as determined by the procedures in § 61.355.

(b) An owner or operator who elects to install and operate a waste incinerator will be considered in compliance with this section if the incinerator is subject to and operated in compliance with 40 CFR part 264, Subpart O.

(c)(1) An owner or operator who elects to install and operate a waste incinerator that is not subject to or in compliance with 40 CFR part 264, Subpart O, shall demonstrate by a performance test, initially and at other times as requested by the Administrator, using the procedures specified in § 61.355, that the incinerator achieves a destruction efficiency of 99 percent or greater.

(2) The owner or operator shall identify a process parameter (or parameters) for monitoring that is indicative of proper operation of the incinerator and must document the criteria for selection of that parameter(s) and the range of parameter(s) values that indicate that the required efficiency is being achieved.

(d) If the treatment process has any openings (e.g., access doors, hatches, etc.), all such openings shall be sealed (e.g., gasketed, latched, etc.) and kept closed at all times when waste is being processed, except during inspection and maintenance.

(e) Seals, access doors, and other openings shall be checked by visual inspections initially and quarterly thereafter to ensure that no cracks or gaps occur and that openings are closed and gasketed properly.

(f) Except as provided in § 61.350, when a broken seal or gasket or other problem is identified, first efforts at repair shall be made as soon as practicable, but not later than 15 calendar days after identification.

§ 61.349 Standards: Closed vent systems and control devices.

(a) Enclosed combustion devices (e.g., vapor incinerators, boilers, or process heaters) shall be designed and operated to reduce benzene emissions vented to them with an efficiency of 95 percent or greater or to provide a minimum residence time of 0.75 seconds at a minimum temperature of 816 °C.

(b) Vapor recovery systems (for example, condensers and adsorbers) shall be designed and operated to recover benzene emissions vented to them with an efficiency of 95 percent or greater.

(c) Flares used to comply with this subpart shall comply with the requirements of 40 CFR 60.18.

(d) Closed vent systems and control devices used to comply with the provisions of this subpart shall be operated at all times when emissions may be vented to them.

(e)(1) Closed vent systems shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background, as determined during the initial and quarterly inspections by the methods specified in § 61.355.

(2) A flow indicator shall be installed on a vent stream to the control device to ensure that the vapors are being routed to the device. The flow indicator shall be installed in the vent stream at the nearest feasible point to the control device inlet but before being combined with other vent streams.

(3) All gauging and sampling devices shall be gas-tight except when gauging or sampling is taking place.

(4) Closed vent systems and control devices shall be visually inspected initially and quarterly thereafter. The visual inspection shall include inspection of ductwork and piping and connections to covers and control devices for evidence of visible defects such as holes in ductwork or piping and loose connections.

(5) Except as provided in § 61.350, if visible defects are observed during an inspection, or if other problems are identified, or if detectable emissions are measured, a first effort to repair the closed vent system and control device shall be made within 5 calendar days of detection. Repair shall be completed no later than 15 calendar days after the emissions are detected or the visible defect is observed.

(6) Owners and operators of control devices that are used to comply with the provisions of this section shall monitor the devices in accordance with § 61.354.

§ 61.350 Standards: Delay of repair.

(a) Delay of repair of facilities or units that are subject to the provisions of this subpart will be allowed if the repair is technically impossible without a complete or partial facility or unit shutdown.

(b) Repair of such equipment shall occur before the end of the next facility or unit shutdown.

§ 61.351 Alternative standards for tanks.

(a) As an alternative to the requirements in § 61.343 for tanks, an owner or operator may elect to comply with one of the following:

(1) A fixed roof and internal floating roof meeting the requirements in 40 CFR 60.112b(a)(1).

(2) An external floating roof meeting the requirements of 40 CFR 60.112b(a)(2), or

(3) An alternative means of emission limitation as described in 40 CFR 60.114b.

(b) If an owner or operator elects to comply with the provisions of this section, then the owner or operator is exempt from the provisions of § 61.343 applicable to the same facilities.

§ 61.352 Alternative standards for oil-water separators.

(a) As an alternative to the requirements in § 61.347 for oil-water separators, an owner or operator may elect to comply with one of the following:

(1) A floating roof meeting the requirements in 40 CFR 60.693-2(a).

(2) An alternative means of emission limitation as described in 40 CFR 60.694.

(b) For portions of the oil-water separator where it is infeasible to construct and operate a floating roof, such as over the weir mechanism, a fixed roof vented to a vapor control device that meets the requirements in §§ 61.347 and 61.349 shall be installed and operated.

(c) Except as provided in paragraph (b) of this section, if an owner or operator elects to comply with the provisions of this section, then the owner or operator is exempt from the provisions in § 61.347 applicable to the same facilities.

§ 61.353 Alternative means of emission limitation.

(a) If, in the Administrator's judgment, an alternative means of emission limitation will achieve a reduction in benzene emissions at least equivalent to the reduction in benzene emissions achieved by the applicable requirements in §§ 61.342 through 61.349, the Administrator will publish in the Federal Register a notice permitting the

use of the alternative means for purposes of compliance with that requirement. The notice may condition the permission on requirements related to the operation and maintenance of the alternative means.

(b) Any notice under paragraph (a) of this section shall be published only after notice and an opportunity for a hearing.

(c) Any person seeking permission under this section shall collect, verify, and submit to the Administrator information showing that the alternative means achieves equivalent emission reductions.

§ 61.354 Monitoring of operations.

(a) Each owner or operator subject to the requirements in § 61.349 shall install, calibrate, maintain, and operate according to the manufacturer's specifications a device to continuously monitor the control device operation as specified in the following paragraphs, unless alternative monitoring procedures or requirements are approved for that facility by the Administrator.

(1) For thermal vapor incinerators, a temperature monitoring device equipped with a continuous recorder. The device shall have an accuracy of 1 percent of the temperature being monitored in °C or ± 0.5 °C, whichever is greater. The temperature sensor shall be installed in the combustion zone.

(2) For boilers and process heaters having a design heat input capacity greater than or equal to 44 megawatts, a monitoring device equipped with a continuous recorder to measure a parameter(s) that indicates good combustion operating practices are being used.

(3) For catalytic vapor incinerators, a temperature monitoring device equipped with a continuous recorder. The device shall be capable of monitoring temperature at two locations, and have an accuracy of 1 percent of the temperature being monitored in °C or ± 0.5 °C, whichever is greater. One temperature sensor shall be installed in the vent stream at the nearest feasible point to the catalyst bed inlet and a second temperature sensor shall be installed in the vent stream at the nearest feasible point to the catalyst bed outlet.

(4) For flares, the owner or operator shall comply with the monitoring requirements of 40 CFR 60.18(f)(2).

(5) Except as provided in paragraph (a)(6) of this section, where a carbon adsorber or other vapor recovery device is used for benzene emissions reduction, a monitoring device that continuously indicates and records the concentration

of organics in the inlet and outlet gas stream shall be used.

(6) Where a carbon adsorber system is used that does not regenerate the carbon bed directly on site in the control device (e.g., a carbon canister), the carbon in the control device shall be replaced with fresh carbon on a regular basis by using one of the following procedures:

(i) The concentration level of the organic compounds in the exhaust vent stream from the carbon adsorption system shall be monitored on a regular schedule, and the existing carbon shall be replaced with fresh carbon immediately when carbon breakthrough is indicated. The device shall be monitored on a daily basis or at intervals no greater than 20 percent of the design carbon replacement interval, whichever is greater.

(ii) The carbon shall be replaced with fresh carbon at a regular predetermined time interval that is less than the maximum design carbon replacement interval.

(b) An alternative operational or process parameter may be monitored if it can be demonstrated that another parameter will ensure that the control device is operated in conformance with these standards and the control device's design specifications.

(c) For waste incinerators not subject to or in compliance with the requirements of Subpart O of 40 CFR Part 264 used to comply with the requirement of § 61.348(c), a monitoring device shall be used that continuously indicates and records the value of the parameter(s) monitored to indicate proper operation and conformance with these standards.

§ 61.355 Test methods, procedures, and compliance provisions.

(a) Each owner or operator who elects to seek an exemption from the emission control requirements in §§ 61.342 through 61.353 shall comply with the provisions of paragraphs (b) through (f) of this section, as applicable.

(b) Each owner or operator shall make an initial determination of the annual quantity of waste managed in each waste stream that contains benzene by one of the following methods:

(1) By selecting the highest annual quantity of waste managed from historical records representing the most recent 5 years of operation or, if the facility has been in service for less than 5 years but at least 1 year, from historical records representing the total operating life of the facility, or

(2) Using the maximum design capacity of the waste management unit, or

(3) By measurements representative of maximum waste generation rates.

(c) Each owner or operator shall make an initial determination of the benzene concentration of each waste stream that contains benzene by collecting a minimum of four representative samples from each such waste stream at a time when the benzene concentration is at its highest expected level using the following procedures:

(1) Where feasible, samples shall be taken from an enclosed pipe prior to the waste being exposed to the atmosphere. When multiple samples are taken, they shall be collected over a short time period to minimize the effects of process variations. For waste in enclosed pipes, the following procedures shall be used:

(i) Samples shall be collected as close as practical to the point of waste generation in order to minimize the loss of benzene prior to sampling.

(ii) A static mixer shall be installed in the process line or in a bypass line.

(iii) The sampling tap shall be located within two pipe diameters of the static mixer outlet.

(iv) Prior to the initiation of sampling, sample lines and cooling coil shall be purged with at least four volumes of waste.

(v) After purging, the sample flow shall be directed to a sample container and the tip of the sampling tube shall be kept below the surface of the waste during sampling to minimize contact with the atmosphere.

(vi) Samples shall be collected at a flow rate such that the cooling coil is able to maintain a waste temperature less than 10 °C.

(vii) After filling, the sample container shall be capped immediately (within 5 seconds) to leave a minimum headspace in the container.

(viii) The sample containers shall immediately be cooled and maintained at a temperature below 10 °C for transfer to the laboratory.

(2) When sampling from an enclosed pipe is not feasible, samples shall be collected in a manner to minimize exposure to the atmosphere and loss of volatiles prior to sampling.

(3) Each waste sample shall be analyzed using one of the following test methods for determining the benzene concentration in a waste stream:

(i) Method 8020, Aromatic Volatile Organics, or

(ii) Method 8021, Determination of Volatile Organic Compounds by Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detection, or

(iii) Method 8240, Gas Chromatography/Mass Spectrometry for Volatile Organics, or

(iv) Method 8260, Gas Chromatography/Mass Spectrometry for Volatile Organics: Capillary Column Technique, or

(v) Method 602, Purgeable Aromatics, as described in 40 CFR 136, Appendix A, Test Procedures for Analysis of Organic Pollutants, for wastewaters for which this is an approved EPA method, or

(vi) Method 624, Purgeables, as described in 40 CFR 136, Appendix A, Test Procedures for Analysis of Organic Pollutants, for wastewaters for which this is an approved EPA method.

(4) The mean benzene concentration shall be calculated by averaging the results of the sample analyses as follows:

$$\bar{Y} = \frac{\sum_{j=1}^n Y_j}{n}$$

Where:

\bar{Y} = The mean benzene concentration of a waste in ppmw.

Y_j = The measured values of benzene concentration for each waste sample, j , in ppmw.

n = The number of waste samples taken (at least 4).

(5) Each owner or operator shall determine the total annual quantity of benzene in the waste by calculating the product of the mean measured benzene concentration and annual waste quantity, as determined in paragraph (b) of this section, for each individual waste stream that contains benzene and summing the results across all waste streams.

(d) Each owner or operator of a facility where the total annual quantity of benzene in the waste is 10 Mg/yr or more who elects to make a determination that the benzene concentration of an individual waste stream is less than 10 ppmw shall comply with the following:

(1) Use the results of the initial waste sampling and analyses required in paragraph (c) of this section and the t-test procedures in paragraph (e) of this section.

(2) Repeat the determination of benzene concentration in each such waste stream on a monthly basis, except as provided in paragraph (f) of this section for reduced sampling frequency. The repeat determinations shall include collection and analysis of a minimum of one waste sample each month using the sample collection and analysis

procedures in paragraph (c) of this section and the t-test procedures in paragraph (e) of this section.

(e) Beginning with the initial waste samples (i.e., at sampling period 0) and thereafter for the samples collected at each subsequent sampling period, i (where $i=1, 2, 3$, etc.), each owner or operator shall conduct a t-test using the following procedures:

(1) Determine the measured value of the benzene concentration of each waste sample collected at sampling period i using one of the analytical methods in paragraph (c) of this section.

(2) Determine the natural logarithm of the measured benzene concentration for each sample collected at sampling period i .

(3) For each sampling period, i , where more than 1 sample is taken, each owner or operator shall:

(i) Calculate the mean of the natural logarithms of the measurement results as follows:

$$\bar{X}_i = \frac{\sum_{j=1}^{n_i} X_{ij}}{n_i}$$

Where:

n_i = Number of waste samples taken at sampling period i .

X_{ij} = Natural logarithm of the measured benzene concentration of waste sample j ($j=1$ to n_i) taken at sample period i .

\bar{X}_i = The mean of the natural logarithms, X_{ij} , at sampling period i .

(ii) Calculate the standard deviation of the natural logarithms of the waste analysis test results as follows:

$$s_i = \sqrt{\frac{\sum_{j=1}^{n_i} X_{ij}^2 - \left(\sum_{j=1}^{n_i} X_{ij} \right)^2 / n_i}{n_i - 1}}$$

Where:

s_i = the standard deviation of X_{ij} at sampling period i .

(4) For each sampling period, i , where only 1 sample is taken, $j=1$, $\bar{X}_i = X_{ij}$, and $s_i=0$.

(5) Calculate the degrees of freedom, K_i , to be used in the t-test as follows:

(i) For the initial sample period ($i=0$):

$K_0 = n_0 - 1$.

(ii) For subsequent sample periods ($i > 0$): $K_i = K_{i-1} + (n_i - 1)$.

(6) Calculate the pooled estimate of standard deviation, S_i , as follows:

- (i) For the initial sample period ($i=0$):
 $S_0 = s_0^2$
 (ii) For subsequent sample periods
 ($i > 0$):

$$S_i = \frac{(K_{i-1})(S_{i-1}^2) + (n_i - 1)s_i^2}{K_i}$$

(7) Select the value of t_i in Table 1 that corresponds to the calculated degrees of freedom, K_i .

(8) Perform a t-test as follows:

$$\left[\bar{x}_i + \frac{(t_i)(S_i)}{\sqrt{n_i}} \right] < \ln(10) \text{ ppmw}$$

If the condition is true, the waste stream is accepted as having a benzene concentration less than 10 ppmw. If the condition is not true, the waste stream must be managed in units that meet the emission control requirements in §§ 61.342 through 61.353 of this subpart.

TABLE 1.—t-VALUES

Degrees of freedom (K_i)	t-values for 90 percent confidence level (t_i)	t-values for 95 percent confidence level (t_i)
1.....	3.078	6.314
2.....	1.886	2.920
3.....	1.638	2.353
4.....	1.533	2.132
5.....	1.476	2.015
6.....	1.440	1.943
7.....	1.415	1.895
8.....	1.397	1.860
9.....	1.383	1.833
10.....	1.372	1.812
11.....	1.363	1.796
12.....	1.356	1.782
13.....	1.350	1.771
14.....	1.345	1.761
15.....	1.341	1.753

(f) Each owner or operator of a facility where the total annual quantity of benzene in the waste is 10 Mg/yr or more and where an individual waste stream has a benzene concentration less than 10 ppmw may repeat the determination of benzene concentration in each such waste stream on a semiannual basis instead of a monthly basis if the test results show a benzene concentration that is consistently below 10 ppmw for 12 consecutive sample periods using the following procedures:

(1) Conduct a t-test for each individual waste sample result taken during the 12 most recent sample periods as follows:

(i) Select the value of t_i corresponding to the most recently calculated value of K_i (calculated during the most recent test) from Table 1.

(ii) Perform a t-test on each individual sample result using the most recent pooled estimate of S_i , and the following equation:

$$X_{ij} + (t_i)(S_i) < \ln(10) \text{ ppmw}$$

(2) If the condition is true for each sample result derived over the 12 most recent sample periods, the owner or operator may switch to or continue using semiannual sampling. Documentation showing the waste sampling and t-test results over the 12 most recent sample periods shall be provided to the Administrator. If the condition is not true, the owner or operator shall switch to or continue using monthly sampling.

(g) Each owner or operator of a facility required to comply with § 61.348(a) to reduce the benzene concentration, shall determine the benzene concentration of the waste stream exiting the treatment device as follows:

(1) An initial determination of the benzene concentration in the treated waste shall be made by collecting and analyzing a minimum of four samples of the waste stream as it exits the treatment device using the procedures in paragraph (c) of this section.

(2) An initial demonstration that the benzene concentration of the treated waste is less than 10 ppmw shall be made by conducting a t-test as described in paragraph (e) of this section.

(3) If the condition in paragraph (e)(8) of this section is true, the treatment device is accepted as operating as designed. If the condition is not true, the treatment device is not in compliance with the requirements of this subpart.

(h)(1) Except as provided in paragraph (i) of this section, the determination of benzene concentration in the treated waste shall be repeated on a daily basis by collecting and analyzing one or more samples each day using the procedures in paragraph (c) of this section and then conducting a t-test following the procedures in paragraph (e) of this section.

(2) If the condition in paragraph (e)(8) of this section is true, the treatment device is accepted as operating as designed. If the condition is not true, the treatment device is not in compliance with the requirements of this subpart.

(i) In lieu of measuring the benzene concentration from a treatment process on a daily basis, as required in paragraph (h) of this section, the owner or operator may elect to demonstrate

compliance with § 61.348(a) by monitoring an operational or process parameter (or parameters) on the treatment process that is indicative of proper system operation and a benzene concentration less than 10 ppmw in the exit stream from the treatment process.

(j) For each waste stream that has been treated to reduce the benzene concentration, as required in § 61.342(b), the owner or operator shall demonstrate that the benzene concentration in the waste stream exiting the treatment process was not achieved by dilution. No dilution is presumed to occur if the treated waste meets one of the following conditions:

(1) The benzene concentration of the outlet stream is less than 10 ppmw when all waste streams entering the treatment process have a benzene concentration of 10 ppmw or greater and the quantity of waste exiting the process is no greater than the quantity of waste entering the process.

(2) The benzene concentration in the outlet stream is less than or equal to the concentration of the most dilute waste stream entering the treatment process when one or more of the entering waste streams have a benzene concentration less than 10 ppmw and the quantity of waste exiting the treatment process is not greater than the quantity of waste entering the process.

(3) The benzene concentration of the waste exiting the treatment process is less than the value of C as calculated in the following equation:

$$C = \frac{\sum_{j=1}^m (Q_{a_j} \times 10 \text{ ppmw}) + \sum_{i=1}^n (Q_{b_i} \times C_{b_i})}{\sum_{j=1}^m Q_{a_j} + \sum_{i=1}^n Q_{b_i}}$$

Where:

C = Benzene concentration (ppmw).

Q_{a_j} = Quantity of each waste stream (j) to be treated that has a benzene concentration greater than or equal to 10 ppmw.

Q_{b_i} = Quantity of each waste stream (i) to be treated that has a benzene concentration less than 10 ppmw.

C_{b_i} = The benzene concentration of each waste stream (i) to be treated that is less than 10 ppmw.

m = The number of waste streams with benzene concentrations greater than or equal to 10 ppmw.

n = The number of waste streams with benzene concentrations less than 10 ppmw.

(k) Except as provided in paragraphs (l) and (m) of this section, each owner or operator of a facility where the total annual quantity of benzene in the waste

is less than 10 Mg/yr shall repeat the determination of total annual quantity of benzene in the waste on a monthly basis using the procedures in paragraph (c) of this section.

(l) If the monthly determinations of the annual quantity of benzene in the waste are consistently less than 10 Mg/yr for a period of 1 year, the owner or operator may switch to semiannual determinations. Documentation showing that the calculation of annual quantity of benzene in the waste is consistently less than 10 Mg/yr for each monthly determination shall be provided to the Administrator.

(m) Each owner or operator of a facility where the total annual quantity of benzene in the waste is less than 1 Mg/yr shall repeat the determination of annual quantity of benzene in the waste at any time there is a change in the process that generates the waste if that change could cause an increase in the total annual quantity of benzene in the waste.

(n) Each owner or operator of each waste management unit that is equipped with a closed vent system and control device (other than flares) as required in §§ 61.343 through 61.348 and § 61.352 shall use Method 21 to measure the emission concentrations, using 500 ppmv as the no detectable emission limit. The instrument shall be calibrated each day before using. The calibration gases shall be:

(1) Zero air (less than 10 ppmv of hydrocarbon in air), and

(2) A mixture of either methane or n-hexane and air at a concentration of approximately, but less than, 10,000 ppm methane or n-hexane.

(o) The owner or operator of a source equipped with a flare shall conduct a performance test initially, and at other times as requested by the Administrator, using the test methods and procedures in § 61.18(f).

(p) Each owner or operator of a facility that treats a waste by waste incineration in a unit that does not comply with the requirements of Subpart O of 40 CFR part 264 shall conduct a performance test initially, and at other times as requested by the Administrator, as follows:

(1) All testing equipment shall be prepared and installed as specified in the appropriate test methods.

(2) The mass flowrate of benzene entering the incinerator shall be determined by computing the product of the flow rate of the waste stream entering the control device, as determined by the inlet flow meter, and the benzene concentration of the waste stream, as determined using the sampling procedures in paragraph (c) of

this section. Three grab samples of the waste shall be taken at equally spaced time intervals over a 1-hour period. Each 1-hour period constitutes a run, and the performance test shall consist of a minimum of 3 runs conducted over a 3-hour period. The mass flowrate of benzene into the incinerator is calculated as follows:

$$E_b = \frac{K}{n \times 10^6} \left(\sum_{i=1}^n V_i C_i \right)$$

Where:

E_b = The mass flowrate of benzene into the incinerator, kg/hour.

K = The density of the waste stream, kg/m³.

V_i = The average volume flowrate of waste entering the incinerator during each run, i, m³/hour.

C_i = The average concentration of benzene in the waste stream entering the incinerator during each run, i, ppmw.

n = The number of runs.

(3) The mass flowrate of benzene leaving the incinerator exhaust stack shall be determined as follows:

(i) The time period for the test shall not be less than 3 hours during which at least 3 stack gas samples are collected. Each sample shall be collected over a 1-hour period (e.g., in a tedlar bag) to represent a time-integrated composite sample and each 1-hour period shall correspond to the periods when the waste feed is sampled.

(ii) A run shall consist of a 1-hour period during the test. For each run:

(A) The reading from each measurement shall be recorded.

(B) The volume exhausted shall be determined using EPA Method 2, 2A, 2C, or 2D from Appendix A of 40 CFR part 60, as appropriate.

(C) The average benzene concentration in the exhaust downstream of the incinerator shall be determined using EPA Method 18.

(iii) The mass of benzene emitted during each run shall be calculated as follows:

$$M_i = KVC_i(10^{-9})$$

Where:

M_i = The mass of benzene emitted during run i, kg.

V = The volume of air-vapor mixture exhausted, m³, at standard conditions.

C = The measured concentration of benzene in the exhaust, ppmv.

K = Conversion factor, kg/m³.

$K = 3.24$ for benzene.

(iv) The benzene mass emission rate in the exhaust shall be calculated as follows:

$$E_a = \left(\sum_{i=1}^n M_i \right) / T$$

Where:

E_a = Mass flowrate of benzene emitted, kg/hour.

M_i = Mass of benzene emitted during run i, kg.

T = Total time of all runs, hour.

n = Number of runs.

(v) The percent reduction across the incinerator shall be calculated as follows:

$$R = \frac{E_b - E_a}{E_b} \times 100$$

Where:

R = Control efficiency of the incinerator, percent.

E_b = Mass flowrate of benzene into the incinerator, kg/hour.

E_a = Mass flowrate of benzene from the incinerator, kg/hour.

§ 61.356 Recordkeeping requirements.

(a) Each owner or operator of a facility subject to the provisions of this subpart shall comply with the recordkeeping requirements of this section. All records shall be retained for a period of 2 years after being recorded unless otherwise noted.

(b)(1) Results of all measurements and determinations of annual waste quantity and benzene concentrations as specified in § 61.342, shall be recorded.

(2) For facilities that handle less than 10 Mg/yr of waste that contains benzene, as determined using the procedures in § 61.355(b), and facilities that handle less than 1 Mg/yr of benzene in the waste, as determined using the procedures in § 61.355(c), records of the initial determination of waste quantity or total quantity of benzene in the waste shall be retained for as long as the waste is generated.

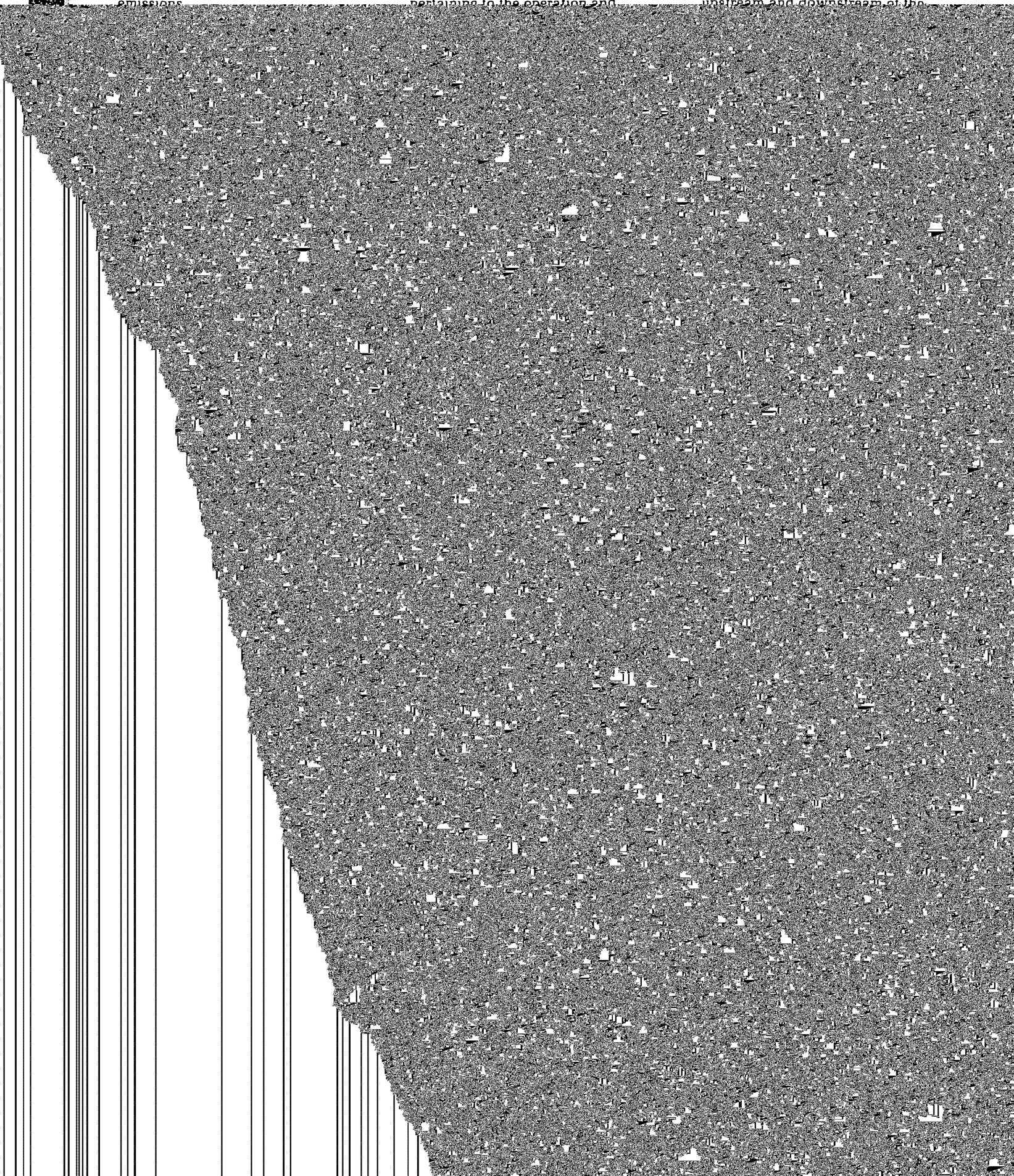
(c) If waste is shipped offsite for treatment or disposal, the name and location of the treatment or disposal facility and the date the waste was shipped shall be recorded, and a copy of the written notification provided to the offsite treatment or disposal facility that the waste is required to meet the provisions of this subpart shall be retained.

(d) The location, date, and corrective action shall be recorded for each visual inspection required by §§ 61.342 through 61.352 when a problem (such as a broken seal, gap or other problem) is

identified that could result in benzene
emissions

(3) The following information
pertaining to the operation and

temperature of the gas stream both
upstream and downstream of the



(b)(1) Each owner or operator subject to this subpart shall submit to the Administrator within 90 days after the effective date of this subpart, or within 90 days after initial startup for new sources with an initial startup after the effective date, a certification that the equipment necessary to comply with these standards has been installed and that the required initial inspections or tests have been carried out in accordance with these standards. Thereafter, the owner or operator shall submit to the Administrator a quarterly certification that all of the required inspections have been carried out in accordance with the provisions of this subpart.

(2) Each owner or operator required to make repeat determinations of the benzene concentration in a wastestream(s) or the annual quantity of benzene in the waste, shall submit initial and quarterly certification that the determinations have been made and that the results are within the required limits.

(3) Each owner or operator who uses a waste incinerator shall submit to the Administrator in a report required under § 61.13, results of the performance test required under § 61.348(c) including identification of the operational parameter(s) to be monitored for proper operation and the measured values for those parameter(s) during the performance test.

(4) Each owner or operator who uses a flare shall submit to the Administrator in a report required under § 61.13, results of the performance test required under § 61.355(o).

(c) A report that summarizes all inspections required by §§ 61.342 through 61.352 during which detectable emissions are measured or a problem (such as a broken seal, gap or other problem) that could result in benzene emissions is identified, including information about the repairs or corrective action taken, shall be submitted initially and quarterly thereafter to the Administrator.

(d) As applicable, a report shall be submitted quarterly to the Administrator that indicates:

(1) Each 3-hour period of operation during which the average temperature of the gas stream in the combustion zone of a thermal vapor incinerator, as measured by the temperature monitoring device, is more than 28 °C below the design combustion zone temperature.

(2) Each 3-hour period of operation during which the average temperature of the gas stream immediately before the catalyst bed of a catalytic vapor incinerator, as measured by the temperature monitoring device, is more

than 28 °C below the design gas stream temperature, and any 3-hour period during which the average temperature difference across the catalyst bed (i.e., the difference between the temperatures of the gas stream immediately before and after the catalyst bed), as measured by the temperature monitoring device, is less than 80 percent of the design temperature difference, or.

(3) Each 3-hour period of operation during which the average concentration of organics in the exhaust gases from a carbon adsorber or other vapor recovery device is more the 20 percent greater than the design exhaust gas concentration level.

(4) All instances when the carbon in a carbon adsorber system that is not regenerated directly on site in the control device is not replaced at the intervals specified in § 61.354(a)(6).

(5) Each period of operation during which the benzene concentration measured in the waste discharged from a treatment process is 10 ppmw or more.

(6) Each 3-hour period of operation during which the average value of the monitored parameter on a waste incinerator is outside the range of acceptable values or during which the incinerator is not operating as designed.

(e) Each owner or operator who elects to install and operate the control equipment in § 61.351 shall comply with the reporting requirements in 40 CFR 60.115b.

(f) Each owner or operator who elects to install and operate the control equipment in § 61.352 shall submit initial and quarterly reports that identify all seal gap measurements, as required in 40 CFR 61.693-2, that are outside the prescribed limits.

§ 61.358 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 112(d) of the Clean Air Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States:

(1) Section 61.342(b)(2), Permission to use alternative treatment process.

(2) Section 61.352, Alternative means of emission limitation.

9. Subpart GG is added as follows:

Subpart GG—National Emission Standard for Benzene Emissions From Industrial Solvent Use at Rubber Tire Manufacturing Facilities

Sec.

61.360 Applicability.

61.361 Definitions.

Sec.

61.362 Standards.

61.363 Performance test and compliance provisions.

61.364 Monitoring requirements.

61.365 Test methods and procedures.

61.366 Recordkeeping requirements.

61.367 Reporting requirements.

61.368 Delegation of authority.

Subpart GG—National Emission Standard for Benzene Emissions From Industrial Solvent Use at Rubber Tire Manufacturing Facilities

§ 61.360 Applicability.

(a) The provisions of this subpart apply to all rubber tire manufacturing plants, except as provided in paragraph (b) of this section.

(b) Any rubber tire manufacturing plant that uses less than 1,500 kg/yr of benzene as a component of a solvent is exempt from the requirements of this subpart, except for the recordkeeping and reporting requirements in §§ 61.366 and 61.367.

§ 61.361 Definitions.

(a) All terms that are used in this subpart and are not defined below are given the same meaning as in the Act, as in Subpart A of Part 61, or as in Subpart BBB of part 60.

"Benzene used as a component of a solvent" means the use of benzene as a trace component in solvents, cements, and tire sprays.

"Rubber Tire Manufacturing Plant" means any combination of process units, operations, and equipment at one site used to manufacture finished rubber tires.

"Solvent" means any substance capable of dissolving another substance to form a uniformly dispersed mixture.

"Temporary enclosure" means any enclosure constructed only for the duration of a performance test around an area where VOC emissions will occur from the application or drying of a solvent. The purpose of a temporary enclosure is to enable measurement of the VOC emission capture efficiency of any emissions control system; as such, it must have included inside its boundaries all sources and control device sinks of solvent-use VOC emissions.

(b) Notations used in this subpart are defined below:

B = Weight percent of benzene present in a solvent, cement, or spray material. Includes small trace quantities.

B_T = Total annual amount of benzene used as a solvent at an affected facility (kilograms per year).

C_v = Concentration of VOC in gas stream in vents after a control device (parts per million by volume).

- C_b = Concentration of VOC in gas stream in vents before a control device (parts per million by volume).
- C_f = Concentration of VOC in each gas stream vented directly to the atmosphere from an affected facility or from a temporary enclosure around an affected facility (parts per million by volume).
- D_c = Density of solvent, cement or spray material (grams per liter).
- D_r = Density of VOC recovered by an emission control device (grams per liter).
- E = Emission control device efficiency, inlet versus outlet (fraction).
- E_T = Total benzene emitted from an affected facility (kilograms per year).
- F_c = Capture efficiency, VOC captured and routed to one control device versus total VOC used for an affected facility (fraction).
- F_o = Fraction of total mass of VOC used in a month by all facilities served by a common solvent, cement or spray material distribution system that is used by a particular affected facility served by the common distribution system.
- L_c = Volume of solvent, cement or spray material used for a month (liters).
- L_r = Volume of VOC recovered by an emission control device for a month (liters).
- M_o = Total mass of VOC used at an affected facility for a month (grams).
- M_r = Mass of VOC recovered by an emission control device for a month (grams).
- Q_a = Volumetric flow rate in vents after a control device (dry standard cubic meters per hour).
- Q_b = Volumetric flow rate in vents after a control device (dry standard cubic meters per hour).
- Q_f = Volumetric flow rate of each stream vented directly to the atmosphere from an affected facility or from a temporary enclosure inside an affected facility (dry standard cubic meters per hour).
- R = Overall efficiency of an emission reduction system (fraction).
- S = Total mass of a solvent, cement, or spray material used (kilograms).

to comply with the requirements of § 61.362(a) or (b).

(b) The owner or operator of an affected facility who elects to comply with the 75 percent emission reduction standard specified in § 61.362(a) and to use a VOC emission reduction system with an incinerator shall conduct a performance test and determine the reduction efficiency, R , as follows:

(1) During the performance test, for the purpose of capturing fugitive VOC emissions, construct temporary enclosures around the application, drying, and other areas where benzene is used or emitted as a solvent. The enclosures must be maintained at a negative pressure to ensure that all evaporated VOC are measurable. Determine the fraction (F_c) of total VOC used at the facility that enters the control device:

$$F_c = \frac{\sum_{i=1}^m C_{b_i} Q_{b_i}}{\sum_{i=1}^m C_{b_i} Q_{b_i} + \sum_{i=1}^n C_{f_i} Q_{f_i}}$$

Where:

m = The number of vents from the facility to the control device.

n = The number of vents from the facility to the atmosphere and from the temporary enclosures.

(2) Determine the destruction efficiency of the control device (E) by using values of the volumetric flow rate of each of the gas streams and the VOC content (as carbon) of each of the gas streams in and out of the control device:

reduction system with a carbon adsorber shall conduct a performance test and determine the reduction efficiency, R , as follows:

(1) Determine the density and weight fraction VOC (including dilution VOC) of each solvent from its formulation or by analysis of the solvent using Method 24. If a dispute arises, the Administrator may require an owner or operator who used formulation data to analyze the solvent using Method 24.

(2) Calculate the total mass of VOC used at the facility for the month (M_o) as:

$$M_o = \sum_{i=1}^a L_{c_i} D_{c_i} W_{o_i}$$

Where:

a = The number of different solvents used during the month at the facility.

(3) Calculate the total mass of VOC recovered from the facility for the month (M_r):

$$M_r = L_r D_r$$

(4) Calculate the overall reduction efficiency for the VOC emission reduction system (R) for the month:

$$R = \frac{M_r}{M_o}$$

(d) The owner or operator of a facility who elects to comply with the 1,500 kg/yr emission standard specified in § 61.362(b), and to use an incinerator as part of an emission reduction system to

$$E_T = \left(\sum_{i=1}^a \sum_{k=1}^c S_{ik} B_{jk} \right) (1 - R) + \sum_{j=1}^b \sum_{k=1}^c S_{jk} B_{jk}$$

Where:

a = The number of operations or processes in the facility where solvent use emissions are routed through the control device before being emitted.

b = The number of operations or processes in the affected facility where solvent use emissions are not routed through a control device before being emitted.

c = The number of different solvents containing benzene used at the affected facility.

(ii) For facilities where the different operations are served by a common solvent distribution system such that it cannot be determined directly from records how much of which solvent is used by a specific operation or process, determine the total benzene emitted (E_T), as

$$E_T = \sum_{i=1}^a S_i B_i (1 - F_o R)$$

Where:

a = The number of different solvents containing benzene used at the facility.

F_o = The fraction of the total benzene-containing solvents used in the facility which is used in those operations or processes from which the emissions are routed to the control device. This fraction F_o shall be determined by comparing the production records and process specifications in those benzene solvent-using operations where the emissions are vented to a control device, to the production records and process specifications for all benzene solvent-using operations in the facility.

(e) The owner or operator of a facility who elects to comply with the 1,500 kg/yr emission standard specified in § 61.362(b), and to use a carbon adsorber as part of an emission reduction system to control some or all of the benzene emissions generated from solvent use in the plant shall:

(1) Conduct a performance test and determine the reduction efficiency, R , of the carbon adsorber by the procedure specified in paragraphs (c) (1), (2), (3), and (4) of this section.

(2) Calculate the total benzene emitted, E_T , by the procedure specified in paragraph (d)(2) (i) or (ii) of this section.

(f) An owner or operator of a facility seeking to demonstrate compliance with the standards specified under § 61.362

with a control device other than a incinerator or carbon adsorber shall provide the Administrator with information describing the operation of the control device and method(s) of determining the reduction efficiency.

§ 61.364 Monitoring requirements.

(a) Each owner or operator of a facility that uses an incinerator to comply with the standards in § 61.362 shall install, calibrate, maintain, and operate according to manufacturer's specifications the following equipment:

(1) A temperature monitoring device equipped with a continuous recorder and having an accuracy of ± 1 percent of the temperature being measured expressed in degrees Celsius, or ± 0.5 °C, whichever is greater.

(i) Where an incinerator other than a catalytic incinerator is used, a temperature monitoring device shall be installed in the firebox.

(ii) Where a catalytic incinerator is used, temperature monitoring devices shall be installed in the gas stream immediately before and after the catalyst bed.

(2) A flow indicator that provides a record of vent stream flow to the incinerator at least once every hour. The flow indicator shall be installed in each vent stream at a point closest to the inlet of each incinerator.

(b) Each owner or operator of a facility that uses a carbon adsorber to comply with the standards in § 61.362 shall install, calibrate, maintain, and operate according to manufacturer's specifications the following equipment:

(1) A device that continuously indicates and records the concentration level of organic compounds in the outlet gas stream of each carbon adsorber bed.

(2) A flow indicator that provides a record of vent stream flow to the carbon adsorber at least once every hour. The flow indicator shall be installed in each vent stream at a point closest to the inlet of each carbon adsorber.

(c) An owner or operator of a facility seeking to demonstrate compliance with the standards specified under § 61.362, with a control device other than an incinerator or carbon adsorber shall provide the Administrator with information describing the operation of the control device and the process parameter(s) that would indicate proper operation and maintenance of the device. The Administrator may request

further information and will specify appropriate monitoring procedures or requirements.

§ 61.365 Test methods and procedures.

(a) The following test methods and procedures in Appendix A to 40 CFR part 60, except as noted in (a)(6) of this section or as provided under § 61.13(h), shall be used to determine compliance with the standards specified under § 61.362.

(1) Method 1 or 1A, as appropriate, for selection of the sampling site. The control device inlet sampling site for determining reduction efficiency shall be prior to the inlet of any control device.

(2) Method 2, 2A, 2C or 2D, as appropriate, for determination of the gas volumetric flow rate(s).

(3) Method 3 for air dilution correction, based on 3 percent oxygen in the emission sample.

(4) Method 24 to determine the density and weight fraction of VOC in a solvent.

(5) Method 25 to determine the VOC concentration at the control device inlet and outlet.

(6) OSHA Laboratory Method No. 12 for Bulk Samples, in Appendix D to 29 CFR Part 1910, to determine the percentage of benzene present in a solvent.

(b) Performance testing for incinerators shall include at least 3 runs, with each run of duration at least one hour. Calculation of F_o and E as given in § 61.363(b) (1) and (2) shall be done using C_o , Q_o , Q_i , C_i , C_o , and Q_o values averaged over the three runs.

(c) The control device operating parameters specified in § 61.364 shall be monitored continuously and recorded every 15 minutes. Rolling 3-hour averages shall be computed from the 15-minute average measurements.

§ 61.366 Recordkeeping requirements.

(a) Each owner or operator of a facility shall keep up-to-date, readily accessible records of all data measured during each performance test, and all calculations and supporting documentation for the determination of R , the control system reduction efficiency.

(b) Each owner or operator of a facility shall keep up-to-date, readily accessible records of the equipment operating parameters specified to be monitored under § 61.364 as well as up-to-date, readily accessible records of periods of operation during which the parameter boundaries established during the most recent performance test are exceeded. The Administrator may at any time require a report of these data. Periods of operation during which the

parameter boundaries established during the most recent performance tests are exceeded are defined as follows:

(1) For thermal incinerators, all 3-hour periods of operation during which the average combustion temperature was more than 28 °C below the average combustion temperature during the most recent performance test at which compliance with § 61.362 was determined.

(2) For catalytic incinerators, all 3-hour periods of operation during which the average temperature of the vent stream immediately before the catalyst bed is more than 28 °C below the average temperature of the process vent stream during the most recent performance test at which compliance with § 61.362 was determined.

(3) For carbon adsorbers, all 3-hour periods of operation during which the average VOC concentration level or reading of organics in the exhaust gases is more than 20 percent greater than the average exhaust gas concentration level or reading measured by the organics monitoring device during the most recent determination of the recovery efficiency of the carbon adsorber that demonstrated that the facility was in compliance.

(c) Each owner or operator of an affected facility shall keep up-to-date, readily accessible continuous records of the indication of flow specified under § 61.364 (a)(2) and (b)(2) as well as up-to-date, readily accessible records of all periods when the vent stream is diverted from the control device.

(d) Each owner or operator of a facility complying with the provisions of § 61.360(b) shall keep up-to-date, readily accessible records of the amount of each solvent containing benzene used each month at the facility, and percentage of benzene in each solvent, as determined from manufacturer's formulation specifications or by the OSHA

Laboratory Method No. 12 for Bulk Samples, cited in § 61.365(a)(6). From these data, the amount of benzene used each month shall be calculated and recorded.

§ 61.367 Reporting requirements.

(a) Each owner or operator of a facility complying with the provisions of § 61.360(b) shall submit, within 90 days of the publication of this notice and once a year, every year thereafter, a report showing the facility's total annual use of benzene as a solvent. This report shall include:

(1) Calculation of B_T , the total annual solvent use of benzene, using the equation

$$B_T = \sum_{i=1}^a S_i B_i$$

Where:

a = The number of different solvents, cements, and tire sprays used during the year in all tire manufacturing operations in the facility.

(2) Supporting documentation and data for the calculation of B_T .

(b) Each owner or operator subject to § 61.362 shall notify the Administrator of the specific provisions of § 61.362 (a) or (b) with which the owner or operator has elected to comply. Notification shall be submitted with the notification of initial start-up required by § 61.09 or with the source report required by § 61.10, as applicable. If an owner or operator elects at a later date to use an alternative provision of § 61.362, then the Administrator shall be notified by the owner or operator 90 days before implementing a change and, upon implementing the change, a performance test shall be performed as specified by § 61.364 within 90 days. If an owner or operator elects at a later date to claim exemption from the requirements of § 61.362 under the provisions of § 61.360(b), then the Administrator shall be notified by the owner or operator 90 days before the exemption is claimed.

(c) The owner or operator of an affected facility shall:

(1) Report the results of each performance test to the Administrator within 30 days of the performance test, including the calculation of "R" and all supporting documentation and data.

(2) Report quarterly:

(i) All periods of operation in that quarter during which the operating parameter boundaries established during the most recent performance test are exceeded. The operating parameters are those specified in § 61.364, and the criteria for exceedance are those specified in § 61.366.

(ii) All periods in that quarter during which the vent stream is diverted from the control device.

(d) The owner or operator of a facility who elects to comply with the 1,500 kg/yr emission standard specified in § 61.362(b) shall, in addition to reporting those items specified in paragraph (c) of this section, report quarterly the calculation of E_T , total benzene emissions, and all supporting documentation and data. The calculation of E_T shall be on a 1-year rolling average basis by an E_T value for each month and the averaging of the monthly values. For the first report for an existing facility, the E_T values for the preceding 6-month period shall be averaged and scaled up proportionally to a year. If the affected facility has been operating for less than a year, then E_T shall be calculated on the basis of those months of operation and then scaled up proportionally to a year.

§ 61.368 Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 112(d) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: No restrictions.

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