ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[AD-FRL-3620-4]

RIN 2060-AC41

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:

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^{-6} 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 [a]

Emission points	Control technology efficiency (%)	Option 1		Option 2	
		Furnace	Foundry	Furnace	Foundry
Final cooler, cooling tower; napthalene 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

[a] 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 approachas 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^{-6}) 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 rot 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 NESHAP 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 NESHAP 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-J-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 ard 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.

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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 m^3 (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.

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 slop 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 95 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

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, 1988, 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 cm^2 per meter of vessel diameter (10.0 in^2 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 cm^2 per meter of vessel diameter (1.0 in^2 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.

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§ 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 an 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.

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§ 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.

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§ 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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