assessment, the revised smelter arsenic balances were used to predict arsenic emissions from the process streams, and it was assumed that 100 percent of the arsenic would be controlled (i.e., the risk was reduced to zero). The EPA estimated the health risks associated with process emissions at all primary copper smelters where gas cooling could potentially be applied to reduce inorganic arsenic emissions from one or more process streams. The estimates were prepared using HEM. The smelters for which these risk estimates were prepared include the smelters for which gas cooling was evaluated as a control option at proposal plus Phelps Dodge-Ajo. The estimates of annual incidence associated with current process emissions at these smelters that could potentially be reduced if gas cooling were used are shown in Table III-5.

TABLE III-5.—ESTIMATED ANNUAL INCIDENCE ASSOCIATED WITH PROCESS EMISSIONS AT SMELTERS WHERE GAS COOLING COULD POTENTIALLY BE APPLIED AS A CONTROL OPTION

Smelter	Process stream(s)	Annual incidence (cases/yr)
Kennecott-Hayden	Smelting Furnaces	0.0028
Kennecott-McGill	Smelting Furnaces and Converters.	0.0008
Magma-San Manuel	Smelting Furnaces	0.0013
Phelps Dodge-Ajo	Smelting Furnaces	0.0034
Phelps Dodge-Douglas.	Roaster, Smelting Furnaces and Converters.	0.0036
Copper Range-White Pine.	Smelting Furnaces	0.0001

The EPA has also estimated preliminary annual costs associated with process stream gas cooling. For the purpose of these estimates, it was assumed that gas stream cooling to 121°C (250°F) or below could be achieved without requiring that special measures be taken to prevent corrosion problems. The annualized cost estimates are shown in Table III-6. It is important to note that these costs are approximate and may not accurately reflect the actual cost of applying gas cooling. However, EPA believes these estimates do provide a general indication of the relative magnitude of the costs of applying gas cooling as a control option.

TABLE III-6.—Preliminary Estimate of Costs to Apply Gas Cooling as a Control Option[a]

Smelter	Process stream(s)	Annualized cost
Kennecott-Hayden	Smelting Furnaces	$ 1,200,000
Kennecott-McGill	Smelting Furnaces and Converters.	[b] 11,800,000
Magma-San Manuel	Smelting Furnaces	4,700,000
Phelps Dodge-Ajo	Smelting Furnaces	1,600,000
Phelps Dodge-Douglas.	Roaster, Smelting Furnaces and Converters.	10,300,000
Copper Range-White Pine.	Smelting Furnaces and Converters.	[c] 2,500,000

[a] Annualized costs include cost of reheating gas stream to stream temperature before cooling and, except as noted, it is assumed that the existing particulate control device would not have to be replaced.
[b] Includes cost of new particulate control device for the converter stream.
[c] Includes cost of new particulate control device for the smelting furnace stream.

As can be seen from Table III-5, the annual incidence associated with the process emission streams to which gas cooling could potentially be applied is very low in all cases, with 0.0036 incidence per year being the highest. Thus, even if gas cooling could reduce process stream emissions by 100 percent, the reduction in risk would be very small. In addition, the cost of achieving this small reduction in risk could be significant, as shown in Table III-6. These considerations led EPA to conclude that even if gas cooling to 121°C (250°F) or below were a feasible control option for process emissions at these smelters, the costs would be greatly disproportionate to the reduction in risk that could be achieved, and therefore gas cooling should not be required.

The State of New Mexico commented that if EPA uses emission estimates for ASARCO-El Paso that reflect improvement in the capture efficiency of the building evacuation system to 90 percent, EPA must include provisions in the regulation requiring maintenance of 90 percent capture efficiency by the building evacuation system and provisions to verify that the system is being properly operated and maintained.

In response to this comment, EPA reviewed its analysis of emissions from and operations of the converter building at the ASARCO-El Paso smelter to ensure that decisions and analyses were made based on the best information available. The reassessment included: (1) An on-site inspection of the converter building ventilation system; and (2) discussions with ASARCO regarding anticipated future operation of the system after installation of the converter secondary hoods and the impact of the computerized gas management system on fugitive emissions. The on-site inspection showed that the converter building evacuation system is achieving about 90 percent capture efficiency and EPA believes that if the existing total flow rate from the converter building is maintained after installation of the converter secondary hoods the capture efficiency of the building evacuation system should not be diminished. The EPA also recognizes that the converter secondary hoods could, by altering the dispersion of emissions and gas flow within the building, affect the performance of the building evacuation system. Since the design of the ventilation system incorporating the converter secondary hoods has not been established yet, EPA cannot determine what the effects will be and whether it is necessary to require maintenance of 90 percent capture efficiency in the converter building. The EPA also cannot determine whether it is necessary or reasonable to maintain 90 percent capture efficiency owing to uncertainties in the emission factor for the anode furnace and the converter fugitive emission factor and their effect on estimates of fugitive emissions from the building. To determine the necessary level of control, it would be necessary to monitor emissions, air flows, and system changes after installation of the converter secondary hoods.

From discussions with ASARCO and review of applicable State and SIP requirements, EPA concluded that ASARCO will continue to maintain the converter building in its present condition if this can be done without increasing worker exposures and creating unacceptably high temperatures in the work area. While it appears likely that ASARCO will maintain a relatively closed building, neither EPA nor ASARCO can determine with certainty whether this will be technically feasible. Therefore, the standard does not include provisions requiring maintenance of 90 percent capture efficiency in the converter building or maintenance of the measures taken by ASARCO to seal the building. The standard does, however, require ASARCO, or the owner or operator of any other facility that might be required to install converter secondary hoods, to report any significant changes in the operation of the emission control system capturing and controlling emissions from converter operations. Examples of changes that must be reported are reductions in air flow through the capture system of more than 20 percent and an increase in the area of the converter building that is open to the atmosphere. Because changes could affect the capture efficiency achieved by the secondary hoods and the building evacuation system, EPA will evaluate these if they occur.

Standard for New Smelters. The State of New Mexico commented that EPA has failed to determine control requirements for new smelters that will provide an ample margin of safety for protection of public health. The State of New Mexico thought that a thorough review by EPA would result in additional control requirements beyond those proposed for existing smelters. The EPA did not develop a separate standard for new smelters because it is EPA's best projections that no new primary copper smelters will be built during the next 5 years. To determine the applicable control measures and the impacts and benefits of those measures, it is necessary to rely on reasonable projections of possible new construction, including projections of process technologies and associated emission rates which would be associated with new plants. Consequently, EPA's analysis at proposal was based on application of control to the existing domestic primary copper smelters. Should any new primary copper smelters be constructed and the converter arsenic feed rate is above the cutoff, the standard would require control of converter secondary emissions. However, as is evident throughout this rulemaking, the need for and applicability of controls depends to a large degree on knowledge of specific processes and feed materials. Thus, EPA believes that it is impractical to attempt to project emission control requirements for technology that would be installed more than 5 years from now.

Costs and Economic Impact

Comments were received on the estimated costs to control converter secondary emissions and on the economic analysis of the affordability of arsenic controls for low-arsenic copper smelters presented in the July 20, 1983, notice of proposal. Owing to the comments received on the initial cost estimates, EPA revised its estimates of control costs and published estimates for comment in a September 20, 1984, Federal Register notice (49 FR 36877). Comments on the revised estimates were received from the three copper companies that had submitted comments on the initial cost estimates.

In comments on the initial cost estimates, ASARCO, Kennecott, and Phelps Dodge commented that estimated costs for six of their smelters were understated in the proposal and based on faulty assumptions. The companies submitted their estimates of emission control costs for these smelters. In several cases, EPA obtained from the companies additional information on their cost estimates. The EPA reviewed the cost information supplied by the companies and analyzed the differences between these estimates and those made by EPA at proposal. Factors contributing to the cost differences included: (1) Site-specific factors, requiring modification of the converter secondary hood design; (2) installation of new ductwork and fans rather than reuse of existing equipment; (3) different assumptions regarding the control systems needed; and (4) different assumptions for the annualized cost capital recovery factor (i.e., the interest rate and equipment service life). For each case where the company provided additional cost information, EPA reviewed the reasonableness of the companies' assumptions and reevaluated the control costs.

Comments on the revised cost estimates were received from ASARCO, Kennecott, and Phelps Dodge. These comments consisted of comments on EPA's annualized cost factor (i.e., interest rate and equipment service life) as well as comments on EPA's consideration of costs at the specific smelters. The EPA's consideration of the comments on the cost estimates and the economic impact assessments is discussed under three areas: (1) General comments on cost estimating assumptions; (2) comments on cost estimates for specific smelters; and (3) comments on economic impacts.

General Comments on Cost Estimating Assumptions. All three copper companies commented that EPA's annualized cost factor should be based on 15 percent interest and 15-year equipment life. The commenters argued that 15 percent interest represented real interest rates that would be incurred today and that the 15-year equipment life is more realistic for the conditions under which the hoods would be operated.

The EPA'a assumption at proposal was a 10 percent interest rate, and 20-year service life represented a reasonable estimate of costs that would be incurred with the installation of converter secondary controls. The annualized cost estimates are developed assuming dollars of constant value and hence, at the 5 to 6 percent inflation rate experienced at the time of proposal, the 10 percent interest rate represents a constant dollar equivalent of the nominal 15 percent interest rate. Thus, EPA believes that the interest rate assumed is close to the rate suggested by the commenters. The use of the 10 percent interest is further supported by the interest rate being experienced with tax-exempt municipal revenue bond issues, which most firms use to finance pollution control equipment. In general, current interest rates on tax-exempt bonds are below 10 percent. For example, ASARCO, Phelps Dodge, Magma, and Kennecott have financed air pollution controls at interest rates ranging from 3.75 to 10.8 percent. Therefore, EPA believes that a 10 percent interest rate represents a realistic assessment of capital cost of financing air pollution control equipment. The cost analysis an equipment service life of 20 years because that is the service life generally assumed for sheet metal and this life had been used by ASARCO to amortize the cost of installation of launder covers at Tacoma. The Agency recognizes that the service life of the equipment to be used in cost analysis is somewhat a matter of judgment. However, since changing the interest rate from 10 to 15 percent and equipment life from 20 to 15 years will increase the annualized cost by only 18 to 27 percent, these differences in the cost do not affect any decisions on the standard.

ASARCO commented that EPA's use of incremental cost makes the proposed standard appear to be most costly for those companies that have installed the fewest controls in the past and penalizes those that have installed controls. To consider prior installation of controls, ASARCO thought that the cost of operating or scrapping existing equipment should be attributed to the standard. The Agency does not agree that the method of cost analysis penalizes those companies that have installed controls. The assessment of whether to require further emission control at a facility considers the effectiveness of existing control systems in the assessment of present risks and the risk reductions achievable as well as the cost to achieve that emission reduction (cost effectiveness). Thus, prior installation of control systems is explicitly considered in the assessment of the need for additional emission reduction and the approach does not penalize those companies that have previously installed emission control systems.

Regarding ASARCO's second point, the Agencyt recognizes that some of the cited costs (i.e., operating or scrapping of existing equipment) may be legitimate expense, however, EPA did not consider them in this analysis for several reasons. The EPA believes that to consider these costs it would be necessary for EPA to evaluate the validity of the claimed expenses in terms of justification and assigned value. To conduct such an analysis would result in further delays in issuance of this rulemaking. Furthermore, there is no single accounting procedures which is universally used for depreciating equipment. Thus, consideration of costs to scrap equipment is also subject to dispute. Consequently, EPA did not evaluate these costs for the smelters. A prime consideration in this decision was the fact that consideration of these costs would not affect the decision whether to regulate the specific smelters.

Comments on Smelter Specific Cost Estimates. As previously indicated, EPA reviewed each comment on the control cost estimates and where determined to be appropriate reevaluated the control cost estimate. The final cost estimates are presented in Tables III-1 and III-2, along with the final estimates of emission reduction achievable by the best emission controls. The bases of the revisions to the cost estimates for each smelter are summarized below and described in detail in the BID for the promulgated standard (EPA-450/3-83-010b).

ASARCO-El Paso: In comments on EPA's initial cost estimate, ASARCO submitted estimated capital costs for installation of air curtain secondary hoods that were approximately 35 percent higher than EPA's estimate at proposal. The EPA's review of the detailed breakdown of the cost estimate showed that ASARCO's estimate was higher primarily because it included costs for demolition and installation of new ductwork. Since the cost differences reflected slight differences in engineering judgment and were based on sound design and engineering practices, ASARCO's capital cost estimate was used in the reanalysis of annualized control cost. In comments on EPA's revised cost estimate of $1.8 million, ASARCO stated that changes in the design of the ventilation system for the converter secondary hoods have increased the estimated costs by approximately 90 percent. The EPA did not further revise the capital cost estimates from $1.8 million to $3.5 million to reflect these changes because the validity of the cost estimate could not be determined from the information provided. Additional information was not requested since this increase in capital costs in itself would not affect the decision to require converter secondary controls at this smelter.

ASARCO's initial estimate of annualized costs for the converter secondary hoods was about 2.3 times EPA's estimate in the July 20, 1983, notice of proposal. The EPA's and ASARCO's annualized cost analyses differed because ASARCO assumed a 15 percent interest on capital and 15-year equipment life, and attributed a prorated share for operation of the existing control device to the cost of implementing the standard. ASARCO's basis for calculating capital recovery costs was not used in the reanalysis of control costs. The EPA's revised estimate of annualized costs still reflects use of 10 percent real interest on capital and 20 year equipment life because EPA believes this basis more realistically reflects actual capital costs and the expected life for this equipment. Furthermore, on incremental costs of operation of the control device were attributed to this standard for the previously discussed reasons and since EPA is not in a position to realistically evaluate these costs. Therefore, the final annualized costs are the costs presented in the September 20, 1984, notice which reflect the ASARCO's first capital cost estimate of $1.8 million for installation of converter secondary hoods.

ASARCO-Hayden: ASARCO commented that EPA underestimated the capital and annualized costs of converter fugitive emission controls for this smelter. ASARCO argued that EPA's estimates were too low because of site-specific differences that affect hood design (the costs at proposal were derived from actual costs incurred at the ASARCO-Tacoma smelter), and because several direct and indirect costs were not included. The principal difference between EPA's proposal estimate and ASARCO's estimate was the costs pertaining to demolition of the existing secondary hoods and to the actual costs of a new air curtain secondary hood and ductwork structures. The EPA evaluated ASARCO's cost estimate and determined these costs to be reasonable, considering the specific design requirements at this facility. Consequently, ASARCO's capital cost estimate of $3.66 million was used in EPA's reanalysis of control costs for converter operations at ASARCO-Hayden.

ASARCO's estimate of annualized costs differed from EPA's estimate in the use of 15 percent interest on capital, 15 year equipment life, a pro rata share of the existing control device's operating costs, and a write-off of the value of the scrapped existing secondary hoods. Again, EPA's revised estimate of annualized costs is based on 10 percent real interest and 20 year equipment life rather than ASARCO's basis. The revised costs also do not include the write-off cost or the prorata share of operating costs of the existing ESP. The EPA did not consider it appropriate to attribute the write-off costs to the cost of the converter secondary controls since the emission and cost analysis (i.e., cost-effectiveness) considers the cost to achieve additional emission reduction. The operating costs of the existing ESP also were not included since EPA could not verify that the standard would significantly affect the cost to operate this control device. Therefore, the final estimate of annualized costs only reflects the higher capital costs for installation of converter air curtain secondary hoods at this smelter.

Kennecott-Utah: Kennecott commented that EPA's estimate of control costs for converter and matte and slag tapping operations were low. The EPA's review of a detailed breakdown of the capital cost estimate for converter controls showed the primary reason for the difference in the two estimates was that Kennecott's estimate included costs for installation of new ductwork and fans. The EPA reviewed Kennecott's capital cost estimates for accuracy and adherence to sound engineering principles and concluded that the costs were reasonable. Therefore, Kennecott's estimate of capital costs for converter controls were used in EPA's revised cost estimates.

Kennecott's annualized cost of converter controls also included a capital recovery cost based on 15 percent interest and 15 year equipment life. For the previously described reasons, EPA's revised annualized cost estimate is based on 10 percent real interest and 20 year equipment life. Thus, the revised annualized costs only reflect the increase in the capital costs of the secondary hoods.

Kennecott's capital cost estimates for matte and slag tapping controls differed significantly from EPA's primarily because costs for new ductwork, increased fan capacity, and a larger capacity control device (11,500 acmm [400,000 acfm]) were included. In the revised estimate of capital cost, EPA assumed use of new ductwork and increased fan capacity, but did not assume use of the larger capacity control device since the capacity was significantly in excess of that normally used. In comments on the revised cost estimates, Kennecott reiterated its belief that the higher capacity control device is needed. The EPA considered these comments and concluded that, considering costs and crane availability, a reasonable design would provide sufficient capacity to treat emissions from simultaneous tapping of one matte and one slag stream (i.e., the previously assumed capacity of 5,600 acmm

[200,000 acfm]). The EPA also considered that further revision of the cost estimate would not be useful since the cost to control matte and slag tapping emissions was disproportionate to the risk reduction at the lower capacity control device. Therefore, EPA's estimated capital cost for the control device was retained and the final cost estimate reflects Kennecott's estimated costs for new ductwork and fan capacity.

The annualized costs for matte and slag tapping controls estimated by Kennecott again used 15 percent interest and 15 year equipment life as the basis of the capital recovery factor. The final cost estimates reflect only the higher capital cost for installation of matte and slag tapping controls.

Kennecott-Hayden: For its Hayden smelter, Kennecott provided estimates of capital and annualized costs for converter secondary controls, which were only slightly higher than EPA's estimates at proposal. Kennecott's capital cost estimates were only 19 percent higher than EPA's and were accepted as reasonable. Their estimate of annualized costs was revised to reflect a 10 percent interest rate and 20 year equipment life basis for calculating capital recovery costs.

Kennecott-McGill: Kennecott's estimates of capital and annualized costs for controls on converters and matte and slag tapping operations were slightly lower than EPA's estimates at proposal. The EPA reviewed the cost estimates provided by Kennecott and concluded their estimates were reasonable. Consequently, the final cost estimates reflect only minor changes that resulted from Kennecott's comments.

Phelps Dodge-Morenci: Phelps Dodge submitted capital and annualized cost estimates for installing converter secondary emission controls that were considerably higher than EPA's estimates at proposal. Phelps Dodge's capital cost estimate differed from EPA's in its inclusion of: (1) costs to demolish the existing secondary hood system and to replace the existing ductwork and fans; and (2) costs for a gas treatment plant (stainless steel ESP's and lime spray pretreatment). The EPA reviewed the basis of Phelps Dodge's cost estimates, and concluded that only the additional costs for demolition of the existing system and replacement of ductwork were reasonable. The costs for gas treatment were considered to be unnecessary because EPA would not require operation of the converter secondary emission control system at a temperature below the acid dew point of the gas stream. The costs for demolition of the existing system and installation of new ductwork and fans were accepted since they were based on actual expenses incurred by Phelps Dodge in installing a secondary hood on a converter at Morenci. Therefore, EPA revised the capital costs for converter controls using Phelps Dodge's estimate of costs to demolish and replace existing ductwork. The revised capital cost for control of converter secondary emissions also reflects use of a baghouse rather than an ESP fabricated of stainless steel to control emissions. (The capital cost of a baghouse was included in the cost estimate presented at proposal). Phelps Dodge's comments on the revised estimate were that a stainless steel ESP is necessary for treatment of gas streams below the acid dew point and is the proper basis for determining control costs for this smelter. The capital cost estimate was not revised to reflect use of a stainless steel ESP as recommended since the standard would not require the control device to be operated below the dew point of the gas being treated. In addition, revision of the cost estimate would not affect the decision to require control of converter fugitive emissions at this smelter. The final capital cost estimate, thus, reflects the cost to demolish and replace existing ductwork and the cost of a baghouse. The final cost estimate is the same as the estimate used in the September 20, 1984 notice.

Phelps Dodge estimated annualized costs using a capital recovery factor based on 15 percent interest on capital and 15 year equipment life, their estimate of capital costs, and utilities required for an ESP. As with the cost estimates discussed earlier in this section, EPA calculated the capital recovery cost for the revised capital cost estimate assuming 10 percent real interest and 20 year equipment life. In addition, Phelps Dodge's estimate for electric power costs was adjusted to apply to a baghouse rather than an ESP. The final estimate of annualized costs primarily reflect the higher capital costs of the control system. The final cost estimate is the same as the estimate given in the September 20, 1984 notice.

Phelps Dodge-Ajo. Phelps Dodge commented that EPA's estimated costs to cool the reverberatory furnace offgases and collect condensed inorganic arsenic particulate should Phelps Dodge not convert the furnace to oxy-sprinkle smelting and install an acid plant were too low. To support its argument, Phelps Dodge submitted cost estimates. As previously discussed, EPA cannot presently determine the technical feasibility of cooling gas streams below the acid dew point without creating corrosion problems or predict the emission reduction that could be attained. Moreover, owing to the changes in the estimate of inorganic arsenic emissions from this smelter, the reduction in risk is very small and the costs are disproportionately high. Therefore, EPA is not requiring that gas stream cooling be used and is not revising its cost estimates since this option would not be selected at the lower cost.

Comments on Economic Impacts. Comments on costs and economic impacts were also received from NRDC and the Sierra Club, Grand Canyon Chapter. The NRDC commented that to assess the affordability of controls EPA must obtain verifiable documentation of company claims of the economic impacts of control measures, such as financial planning documents for the affected smelters. The NRDC charged that the existing economic information on the facilities is incomplete and unsupported. The EPA believes that the cost and economic information is sufficiently complete and documented for the following reasons. The EPA's economic analyses for primary copper smelters are based on data which are available in the public domain or from the companies. Information was obtained from a wide variety of sources, including past submissions of data by the copper companies, reports prepared by others on the companies, information on prices from standard reference, and engineering cost studies of the specific operations. As previously described, detailed economic and engineering information has been obtained under Section 114 of the Act from several of the copper companies since proposal. Therefore, EPA believes that obtaining further information such as internal planning documents is unnecessary and EPA's economic analyses of affordability are sufficient for decisionmaking purposes.

The Sierra Club stated that the proposal should include sufficient economic data for the public to judge the economic feasibility and costs of controls, including income figures for all operations at a smelter such as gold and silver production. In addition, the actual costs of plant closure should be detailed for each smelter and compared to benefits (e.g., health cost savings). The EPA agrees with the commenter that sufficient information should be presented to allow the public an opportunity for meaningful participation in the rulemaking. It is for this reason that detailed supporting information is made available for public inspection in the docket and a document summarizing the supporting information is made available to interested parties. The EPA believes that, since the economic analyses and their bases are available, sufficient information has been provided. Because the financial health of the low-arsenic primary copper smelters depends heavily on the price of copper, EPA does not believe that consideration of income from by-products and co-products would significantly have affected the conclusions of the economic analysis for the low-arsenic smelters.

The EPA believes that the recommended comparison of closure costs and benefits is beyond the scope of this rulemaking. To perform the type of analysis suggested by the commenter would require consideration of a large number of factors including: (1) Costs and economic impacts to the affected companies; (2) costs and economic impacts to businesses in the community; (3) social costs, such as impacts on property values, health care costs, lost development opportunities, and unemployment compensation costs; and (4) health impacts associated with unemployment. Some of these costs such as closure costs are relatively easy to quantify (data are readily available, can be developed, and require few value judgements); while others such as impacts on property values, quality of life, and health care costs are extremely difficult to quantify (data are not available, and there is no generally accepted method for quantifying the impacts in economic terms). Consequently, EPA believes this type of analysis cannot be reasonably done within this rulemaking. These secondary impacts are considered qualitatively in selecting the level of a standard. Therefore, EPA believes that this type analysis is not necessary for selecting the appropriate control level for the standard. Taking all available qualitative and quantitative information into account, EPA judges that the social and economic costs of closing the smelters would far outweigh the resulting health benefits.

Emission Monitoring Requirements

ASARCO and Phelps Dodge took issue on several grounds with the proposed opacity monitoring requirement for converter secondary emissions exiting a control device. First, ASARCO and Phelps Dodge commented that opacity monitoring will not be useful for evaluating proper operation and maintenance of control devices because short-term variations in particle size distributions due to combining of gas streams will cause variations in observed opacities that are not associated with a change in outlet mass concentration. ASARCO and Phelps Dodge recommended revision of the opacity monitoring requirement to a requirement for keeping a record of all maintenance of the control device and for annual emission testing of the device. The EPA agrees with the commenters that, if they occur, significant fluctuations in particle size distribution of emissions could cause variations in observed opacities. However, the magnitude of opacity variations due to particle-size changes are expected to be small relative to changes associated with malfunctions or improper operation or maintenance of the control device. Because the intent of the opacity monitoring requirement is to detect increased emissions due to malfunctions and improper operation, EPA reassessed the opacity monitoring requirement and concluded that the most reasonable approach is to establish a maximum 1-hour average reference opacity level that considers the fluctuations in opacity levels. One-hour average opacity levels above the reference opacity level would indicate that the collection device may no longer be meeting the particulate matter emission limit. A Method 5 test could then be performed to determine compliance.

ASARCO and Phelps Dodge also disagreed with EPA's requiring the use of transmissometers for monitoring gas streams with low particulate concentrations. ASARCO commented that frequent Method 5 testing would have to be performed to determine the validity of using transmissometers to monitor compliance with the 11.6 mg/dscm (0.005 gr/dscf) emission standard because opacity levels associated with concentrations of 11.6 mg/dscm (0.005 gr/dscf) are close to or at a transmissometer's limit of detection. The EPA agrees with ASARCO and Phelps Dodge that opacity levels associated with concentrations of 11.6 mg/dscm (0.005 gr/dscf) may be near the detection limit of transmissometers. The intent of the proposed requirement was to monitor for significant changes in the level of particulate matter emission control resulting from operation or maintenance practices, and such increased levels would be well above the detection limit of the transmissometer. Therefore, EPA revised the method for defining excess opacity levels. The revisions include using 1-hour averages of opacity data to determine the highest average and establishing the reference opacity level at 5 percent opacity above the highest 1-hour average opacity determined during an evaluation period that includes the emission test. The EPA believes that reference opacity levels defined in this manner will be a useful indicator of significant changes in the performance of the control device.

The Administrator would like to emphasize that this opacity monitoring and reporting of excess emissions is only a monitoring requirement and is not a directly enforceable opacity standard. However, excess emissions do provide evidence of possible violation of operation and maintenance requirements. In other standards, the EPA establishes enforceable opacity limits based on visual evaluations of opacities of gases exiting stacks and other conveyances, and on consideration of the effect on opacities of the expected range of normal operating variables. In addition, these opacity limits are based on Method 9, which determines opacity using human observers. At the primary copper smelters, opacity limits could not be established for the control devices because emissions from several control devices frequently are discharged in common to the atmosphere through one stack. Consequently, EPA established the monitoring requirements.

ASARCO further commented that they have had frequent maintenance problems with their existing transmissometers and that these problems are costly and undercut the usefulness of the instrument. The EPA does not agree that all transmissometers will experience frequent maintenance problems. Available information on performance of transmissometers indicates that transmissometers which meet 40 CFR 60 Appendix B specifications have repeatedly demonstrated more than 95 percent availability when properly operated and maintained. Therefore, EPA believes that transmissometers are a useful means for ensuring continuous effective operation of collection devices.

Magma Copper Company questioned whether the waiver of the emission test requirements referred to in § 61.175(a)(4) could be used to waive the requirement for collection and analysis of daily grab samples of matte, slag, and total smelter charge for any smelter that has arsenic inputs well below the cutoff. The waiver of emission tests discussed in § 61.13 and referred to in § 61.175(a)(4) of the proposed regulation for low-arsenic copper smelters, applies to sources that are required to demonstrate compliance with the standards through periodic testing of emissions. Thus, this reference in the regulation does not refer to the sampling requirements for demonstrating applicability.

The EPA agrees that the daily collection and monthly analysis of grab samples would prove burdensome for a smelter that fell well under the applicability cutoff of 75 kg/h (164 lb/h) converter arsenic charging rate. Consequently, paragraph 61.174(g) has been included in the final regulation to permit an owner or operator to petition the Administrator for a modified sampling schedule if the analyses performed in the first year of the standard show the source to have very low arsenic processing rates in relation to the cutoff values. An example of modified sampling schedule would be weekly, instead of daily, grab samples being collected to form the composite monthly samples.

Compliance Provisions

The proposed compliance provisions have been redrafted to remove provisions that were established as general provisions to 40 CFR Part 61 (see 50 FR 46284) and to improve the organization of sections in the regulation. The final standard also includes specific provisions requiring the owner or operator to operate the secondary hood system in a manner which will achieve maximum capture of arsenic emissions. The optimum operating conditions necessary to achieve maximum capture of emissions will be determined by the Administrator. The Administrator will propose separate optimum operating conditions for each secondary hood system which will be based on an assessment of capture efficiencies achieved by the hood under different operating conditions. The assessment of hood capture efficiency may include an evaluation of emissions by a panel as well as evaluation of hood design and performance by EPA personnel. After a period of public comment, the Administrator will publish final optimum operating conditions for each system.

The standard requires the owner or operator of each secondary hood system to submit to the Administrator a list of initial operating conditions for the system that in the owner or operator's judgment result in the greatest capture of converter secondary emissions. This list must be submitted by September 3, 1986, or within 30 days of the initial operation of the system, whichever is later. The system shall be operated under these conditions, or under conditions specified by the Administrator, until optimum operating conditions are established.

The potential use of a panel to evaluate hood performance was discussed in the July 20, 1983, **Federal Register** notice of proposal (48 FR 33112). The EPA requested comments on the proposed use of a panel in evaluating air curtain secondary hoods and in determining optimum operating conditions. Based on comments received on this "panel approach", the Administrator thinks that the method for establishing optimum operating conditions for the hoods should be clarified. The conditions will be determined by the Administrator based on visual observations of overall capture efficiency under different operating conditions such as different face velocities in the exhaust hood, horizontal slot dimensions, air velocity through the horizontal slot, and other operating conditions specified by the Administrator. These observations may be made by EPA personnel alone or by a group of individuals (i.e., "panel") comprised of representatives of EPA, industry, and the State or local air pollution control agency.

A variety of comments was received concerning the method for determining optimum hood operating conditions. Some commenters endorsed the concept of the panel approach, while others opposed it. One commenter argued that the panel approach is subjective and thus will result in different requirements for different facilities. The commenter suggested that EPA use the tracer mass balance procedure to determine capture efficiency of air secondary hoods. The EPA agrees with the commenter that visual evaluation of fume capture efficiency is a subjective procedure; however, EPA believes it is superior to other procedures, including the tracer technique. In tests to evaluate the air curtain secondary hood at ASARCO-Tacoma, EPA characterized hood performance by tracer mass balance tests, visual evaluations, and transmissometer measurements. The tracer mass balance procedure used could not at any one time evaluate the capture efficiency within the entire converter-secondary hood area. That is, owing to technical limitations, the capture efficiency could be evaluated only within subregions such as near the air curtain or near the converter. In contrast, the visual observations were overall assessments of the entire converter-secondary hood area. The average observations for the various converter operating conditions showed the same trends as the tracer experiments. In addition, tracer mass balance determinations are difficult and expensive to conduct. The EPA, therefore, believes it is unnecessary and unreasonable to require tracer mass balance determinations to evaluate hood capture efficiencies. The study also found the transmissometer data to be of limited usefulness because, again, overall capture efficiencies for the entire converter-secondary hood area could not be evaluated. (The transmissometer was mounted on top of the air curtain and measured emissions escaping capture by the air curtain and passing through the slot. It was not practical to monitor emissions escaping the lower portion of the hood and pouring into the converter aisle.) Consequently, the Administrator concluded that visual evaluation of fume capture efficiency should be used to evaluate optimum conditions for secondary hoods.

The use of observers to determine hood capture effciencies would not change the basic control requirements for the facilities. The standard requires installation of an air curtain secondary hood and use of operating practices that maximize the capture efficiency obtained. The EPA recognizes that design and operating requirements will vary among facilities and possibly among converters at any given facility. These differences will occur because each air curtain secondary hood will have to be custom designed to fit each existing converter. It is expected that any differences resulting from differences in judgments of capture efficiency will be negligible relative to differences imposed by design constraints.

ASARCO and Phelps Dodge argued that it would be costly and time consuming to use the proposed panel approach to establish optimum operating conditions for the converter secondary hoods. In lieu of the panel, ASARCO and Phelps Dodge recommended that each company be required to optimize its hoods through trail and error and that the company be required to keep a log of the parameters and emissions. during this period. The record would be submitted to EPA for review and assessment. The requirements of the standard do not preclude an owner or operator from conducting studies on the capture effectiveness and operating parameters. In fact, EPA believes that such studies by the owner or operator could expedite the Administrator's evaluation of operating conditions. However, EPA does not believe that the optimum operating conditions should be solely determined by the owner or operator of the source. The EPA believes that optimum operating conditions should be determined by the Agency since evaluation of optimum operating conditions for converter secondary hoods is a further step in the development of the regulation. This part of the standard cannot be developed or established until the equipment required by the regulation is in place and operating. The Administrator will consider the assessment of the secondary hood's performance under a variety of operating conditions in the selection of operating conditions. The specific requirements that will establish optimum capture of converter secondary emissions will then be proposed by EPA in the **Federal Register** and established after consideration of public comments. Until optimum operating conditions are established for the source, the standard requires the owner or operator to operate the hood in a manner which will achieve effective capture of secondary emissions. These operating conditions will be established by the Administrator based on review of operating conditions recommended by the owner or operator of the source.

ASARCO further commented that if EPA decides to use a panel to evaluate and optimize hood operations, EPA should take steps to ensure that the panel is unbiased. ASARCO recommended that the panel be composed of persons knowledgeable about smelting and that it include at least one neutral member who is selected and compensated jointly by EPA and the company. The Administrator will establish optimum operating conditions based on visual assessments of hood capture efficiency under a variety of operating conditions and consideration of public comments on the proposed requirements. Because EPA plans to use observations made by more than one observer and measurements of operating parameters (e.g., hood flow rate, horizontal slot dimension, etc.), significant discrepancies among observations by the different observers would be detectable and, thus, considered in the selection of optimum operating conditions. (Observations of hood capture efficiency by EPA and local air pollution control agency personnel at the ASARCO-Tacoma smelter were generally in close agreement and EPA expects that observations by several individuals should be comparable and any biases detectable.) Public comment on the proposed standard will also serve to identify any bias in the basis for the proposed standard. Consequently, EPA does not agree that additional measures are needed to ensure that the observers and hence the assessments of hood capture efficiency are unbiased.

The NRDC and the USWA supported the panel approach, but favored expanding the size of the panel and its responsibilities. These commenters recommended that the panel include representatives of the union and local environmental groups. It was also suggested that the panel consider all sources of arsenic emissions, enforcement of the standard, and review of monitoring data. The Administrator considered these recommendations and concluded that they were inconsistent with the intended approach and should not be adopted as suggested. The EPA views the determination of optimum operating conditions as a further step in the regulatory development process of this standard. Hence, EPA believes that this determination should be conducted by EPA personnel considering assessments and information provided by EPA personnel, local air pollution control agency personnel, and the affected industry. During the development of the optimum operating conditions, there will be opportunities for NRDC, the USWA and members of the public to review and comment on the basis of the suggested operating conditions. Therefore, EPA believes that it is not necessary to include formally NRDC, the USWA, and other groups in the standards development process. The suggested use of a panel to review control of all arsenic emission sources, enforcement of the standard, and the monitoring data is also considered to be unnecessary. Arsenic emissions from sources in the primary copper smelters are presently being controlled under consent decrees, SIP's and OSHA standards, and additional control of other emission sources cannot be achieved at a reasonable cost. The EPA further believes that it would be inappropriate to delegate enforcement of the standard to a panel.

The NRDC suggested that the optimization panel may need to be chartered under the Federal Advisory Committee Act (FACA) and required to report annually to the Administrator, the local air pollution control agency, and the public on the status of arsenic emission control and prospects for additional emission control. The EPA did not intend to create an advisory committee with the proposed panel approach. The EPA proposed use of a panel to report data which can be used to identify optimum operating conditions for the converter secondary hoods as a means of continuing the development of the regulatory requirements. Hood operating parameters cannot be evaluated, or determined, until the equipment required by the regulation is in place. It is intended that optimum operating parameters will be proposed by the Administrator and established after consideration of public comments. Therefore, EPA has revised the regulation to indicate clearly that the optimum operating conditions for the secondary hoods are established by EPA based on a case-by-case evaluation of the hood's performance and public comments. At present, EPA plans to evaluate each hood's capture efficiency under varying operating conditions using observers, as appropriate and practicable, from EPA, the local air pollution control agency, and industry. The observers will only serve as a fact-finding body and will not recommend operating parameters for secondary hoods. Consequently, EPA does not believe the observers or "panels" need to be chartered under FACA or to report annually to the Administrator.

Impacts of Reporting and Recordkeeping Requirements

The EPA believes that the required reporting and recordkeeping requirements are necessary to assist the Agency in: (1) Identifying sources; (2) determining initial compliance; and (3) enforcing the standards.

The Paperwork Reduction Act (PRA) of 1980 (Pub. L. 96-511) requires that the Office of Management and Budget (OMB) approve reporting and recordkeeping requirements that qualify as an "information collection request" (ICR). To accommodate OMB review, EPA uses 3-year periods in its impact analysis procedures for estimating the labor-hour burden of reporting and recordkeeping requirements.

The average annual burden on primary copper smelters to comply with the reporting and recordkeeping requirements of the final standard over the first 3 years after the effective date is estimated to be about 8,000 labor-hours.

IV. Glass Manufacturing Plants

As indicated in the Overview section of this preamble, a standard limiting inorganic arsenic emissions from glass manufacturing plants was proposed on July 20, 1983, in the **Federal Register** (48 FR 33112). The public comment period for the proposed standard ended on January 31, 1984. The public comment period was reopened from March 20 1984, to April 19, 1984, to allow comment on the proposed method for calculating zero production offset and proposed control options for soda-lime glass furnaces (49 FR 10278). This part of the preamble presents the final standard, its basis, and a discussion of the public comments on the proposed standard.

Summary of Promulgated Standard

Applicability

The promulgated standard for inorganic arsenic emissions from glass manufacturing plants applies to each glass melting furnace that uses commercial arsenic as a raw material. It does not apply to pot furnaces (i.e., furnaces that contain one or more refractory vessels and melt glass by indirect heating), nor does rebricking cause a furnace to become subject to the standard.

Emission Limits

The standard requires that the owner or operator of an existing glass melting furnace limit uncontrolled arsenic emissions to 2.5 Mg (2.75 tons) per year or less or reduce arsenic emissions by 85 percent. Similarly, new or modified glass melting furnaces must keep emissions below 0.4 Mg (0.44 ton) per year or meet the 85 percent reduction requirement.

Compliance Provisions

To demonstrate compliance with the precent reduction option, the owner or operator must determine the concentration of arsenic in the inlet and outlet gas streams to the control device and calculate the emission reduction. Test Method 108 is used to determine arsenic concentration, which consists of gas and particulate phase arsenic.

To demonstrate compliance with the annual uncontrolled emission limits, an owner or operator is required to conduct emission tests unless the amount of arsenic added annually to be an existing furnace is less than 8.0 Mg (8.8 tons) or less than 1.0 Mg (1.1 tons) for new or modified furnaces, and the owner or operator can demonstrate through a material balance that the applicable uncontrolled emission limit is being met. Owners or operators of all affected furnaces must estimate the uncontrolled arsenic emissions for the forthcoming 12-month period each 6 months by multiplying an arsenic emission factor for each type of glass produced by the amount of each type of glass produced during the 12 months.

Continuous Monitoring

An owner or operator who chooses to comply with the percent reduction requirement must continuously monitor the opacity of emissions discharged from the control device. Opacity monitoring must be conducted during the compliance test to establish a reference opacity level. Following the compliance test, owners or operators must reduce all opacity data to 6 minute averages and report any occurrence of excess opacity levels above the reference level to the Administrator. The temperature of the furnace exhaust gas entering a control device must also be continuously monitored and recorded.

Recordkeeping and Reporting Requirements

In addition to the reporting requirements of 40 CFR Part 61, Subpart A, owners or operators must report the results of the continuous monitoring system evaluation, any excess opacity occurrence, and any change from compliance with uncontrolled emission limit provisions to percent reduction provisions. Owners or operators who choose to comply with the annual uncontrolled emission limit must keep records of the arsenic emission factors, supporting calculations, and emission forcasts for the preceding and forthcoming 12-month periods. All owners or operators of a source subject to the standard must maintain records of all measurements, all calculations used to produce emission estimates, monitoring system performance evaluations, any malfunction of process or control equipment, and any maintenance and repairs made to the controls or monitoring systems. All records must be suitable for inspection and retained for 2 years.

Summary of Environmental, Health, Energy, and Economic Impacts

The standard being established today will affect eight existing glass manufacturing furnaces and any new or modified glass manufacturing furnace. It is expected that control devices would have to be installed on two of the existing furnaces or the use of arsenic as a raw material would have to be decreased and that the other six furnaces would be able to continue using their existing control systems to meet the standard. Environmental, energy, and economic impacts of the standard are summarized in Table IV-1.

TABLE IV-1.—SUMMARY OF ENVIRONMENTAL, ENERGY, AND ECONOMIC IMPACTS FOR GLASS MANUFACTURING PLANTS

Plant location	Uncontrolled arsenic emissions (Mg/yr)	Reduction in arsenic emissions (Mg/yr)	Increase in solid waste (Mg/yr)	Increase in energy use (MW-hr/yr)	Decline in profit (percent)
Martinsburg, West Virginia	13.2	11.22	[a]2.0	185	<5
Charleroi, Pennsylvania	3.4	[b]3.40	0	0	0
Danville, Kentucky	7.6	[c]7.40	0	0	0
Charleroi, Pennsylvania	7.3	[c]7.29	0	0	0
State College, Pennsylvania	6.9	[c]6.88	0	0	0
Fall Brook, New York	3.8	[c]3.73	0	0	0
Fall Brook, New York	2.7	[c]2.65	0	0	0
Central Falls, Rhode Island	2.6	[c]2.41	0	0	0
Total	47.5	44.98	2.0	185	<5

[a] Assumes that 90 percent of waste is recycled to furnace.
[b] Assumes that non-arsenic containing glass recipe will be used; no impacts.
[c] Controls presently in place; no additional controls required.

Significant Changes Since Proposal

In response to public comments received on the proposed rulemaking and as a result of EPA re-evaluation, five major changes were made to the proposed standard. These changes involve: (1) Revising the annual limit on uncontrolled emissions above which add-on control is required for existing furnaces, (2) revising the format of the emission limits, (3) allowing the control device to be by-passed for periods of maintenance, (4) eliminating the exemption to 40 CFR Part 60, Subpart CC for sources that comply with the NESHAP, and (5) establishing a provision to exempt certain sources from testing requirements.

Existing Furnace Annual Uncontrolled Emission Limit

After proposal, further examination of the costs, risks, and potential risk reductions associated with inorganic arsenic emissions and controls for specific existing glass manufacturing plants led the Agency to change the regulation by establishing the limit on uncontrolled arsenic emissions for existing glass melting furnaces at 2.5 Mg (2.75 ton) per year. The proposed limit on uncontrolled arsenic emissions of 0.4 Mg/year (0.44 ton) is retained for new or modified furnaces. The rationale for this revision is discussed below under Basis for Standard.

Format of the Standard

The second major change in the regulation since proposal involves a change in the format for emission limits. The proposed standard was in the form of a particulate matter emission limit. The promulgated standard requires owners or operators of glass furnaces to ensure either that uncontrolled arsenic emissions are less than limits described above or that arsenic emissions are reduced by 85 percent. Compliance with the percent reduction requirement is determined using Test Method 108. The rationale for this revision is discussed below under Basis for Standard.

Bypass of the Control Device

The third major change in the regulation allows owners or operators of glass furnaces to petition the Administrator for permission to by-pass the control device for a limited period for purposes of maintaining the control device. However, the Agency has included provisions to minimize arsenic emissions during maintenance periods and will allow by-pass of the control device only upon demonstration of its necessity. The revision is fully discussed in the Discussion of Comments section of this part of the preamble.

Elimination of Exemption from NSPS

In the proposed standard, particulate emission limits were identical to those in the glass manufacturing NSPS (40 CFR Part 60, Subpart CC), and no furnace was allowed to operate with uncontrolled arsenic emissions in excess of 0.4 Mg (0.44 ton) per year. The promulgated standard has been revised such that the emission limits are no longer identical and the exemption from the NSPS is no longer appropriate.

Compliance Testing

In the final major change, EPA created a provision which exempts owners or operators of certain furnaces from the requirement to conduct emission tests to demonstrate compliance. Emission tests are not required for existing furnaces that use less than 8.0 Mg (8.8 tons) arsenic per year and new or modified furnaces that use less than 1.0 Mg (1.1 tons) arsenic per year if the owner or operator demonstrates through a material balance that the applicable annual uncontrolled emission limit is being met. Analysis has shown that at least 70 percent of the arsenic added to the raw materials is retained in the glass product. Therefore, the Agency believes that existing furnaces to which less than 8.0 Mg (8.8 tons) of arsenic is added annually, or new and modified furnaces to which less than 1.0 Mg (1.1 tons) of arsenic is added annually, would not be likely to exceed the respective limits on uncontrolled inorganic arsenic emissions. The Administrator does reserve the right to require an emission test of any furnace using arsenic to ensure that the annual uncontrolled emission limits are not exceeded under any circumstances.

Additional Analyses

As a result of public comments, EPA has conducted additional analyses to ensure that the promulgated standard is based on the most complete and accurate information available. These additional analyses focused on the status of the industry, arsenic emission sources and characteristics, and risk assessment. The scope and results of these additional analyses are summarized below. The analyses and conclusions are discussed in greater detail in the Discussion of Comments section of this preamble and in the BID for the promulgated standard.

Update of Industry Status

At the time of proposal, the Agency had identified a total of 32 glass melting furnaces that use arsenic as a raw material. Five of these furnaces were determined to emit arsenic at uncontrolled levels at or below 0.4 Mg (0.44 ton) per year, which was the proposed cutoff for requiring add-on controls. Of the remaining 27 furnaces, 13 were identified as being controlled by electrostatic precipitators or fabric filters. Arsenic emissions from the 32 furnaces were estimated to be 36.7 Mg (40.4 tons) per year. The Agency also noted at the time of proposal, however, that more arsenic-using furnaces probably existed, although most of these furnaces were believed to be small pot furnaces and all-electric melters or other furnaces that would not be affected by the proposed regulation.

Upon further investigation, a total of 53 additional arsenic-using glass furnaces were identified. Total emissions of arsenic from these 53 furnaces were estimated to be 12 Mg (13.2 tons) per year. Over 60 percent of these additional arsenic emissions arise from a single glass plant which is equipped with 9 individual arsenic-using furnaces, 5 of which emit more than 0.40 Mg (0.44 ton) of arsenic annually. Each of the remaining 44 furnaces identified after proposal were estimated to emit 0.4 Mg (0.44 ton) or less of arsenic per year. Additional data were also gathered after proposal on the 32 furnaces that had been previously identified. It was found that since proposal the use of arsenic had been eliminated from 10 of these furnaces.

The information currently available to the Agency indicates that a total of 75 glass furnaces located at 27 plants are known to use arsenic as a raw material. Arsenic emissions from these 75 furnaces are estimated to be 32.2 Mg (35.4 tons) per year. Of the total arsenic emissions from the source category, nearly 80 percent (25.2 Mg/yr) arise from 11 uncontrolled furnaces each of which emits more than 0.40 Mg (0.44 ton) annually. These 11 furnaces are located at 5 separate glass manufacturing plants. A complete listing of all furnaces known to use arsenic is provided in Appendix C of the BID.

Emission Sources and Characteristics

Several analyses were conducted to estimate the magnitude of inorganic arsenic emissions from various sources within the glass manufacturing plants, and to characterize the factors affecting inorganic arsenic emissions. These analyses included:

(1) An estimate of the magnitude of fugitive emissions of arsenic from glass manufacturing plants (A-83-8/IV-B-11). Although several sources of fugitive arsenic emissions were identified, even under worst case conditions they were found to be very small compared to stack emissions.

(2) An analysis to determine if furnaces that do not add arsenic as a raw material could exceed the proposed 0.4 Mg/yr (0.44 ton/yr) emissions cutoff due to the presence of arsenic impurities in other raw materials (A-83-8/IV-B-12). It was concluded that the concentration of arsenic impurities in other raw materials would be insufficient to result in an exceedance of the proposed emission cutoff.

(3) Estimates of the cost and emission impacts of allowing furnaces to by-pass the emission control device during periods of routine maintenance of the control device (A-83-8/IV-B-10).

(4) An evaluation of the feasibility of reducing or eliminating the use of arsenic in soda-lime glass (A-83-8/IV-B-13).

(5) A study of the factors affecting arsenic emissions from glass melting furnaces, particularly those affecting the proportion of arsenic that is emitted as particulate matter. Additional emission test data were obtained through EPA testing and from industry representatives. The results of this study are reviewed below under Basis for Standard, and more detailed summaries of the emission test data can be found in Appendix A of the BID.

Risk Assessment

Risk assessment for all known arsenic-using furnaces had been performed at proposal. However, for several of these furnaces stack parameter data were not available and model plant parameters were used.

After proposal, stack parameter information was obtained for those furnaces. In addition, more accurate location (latitude/longitude) data were obtained for all furnaces. Risk assessments were then performed for the actual furnaces known to use arsenic rather than for model furnaces. Maximum individual risk and aggregate risk values were calculated for each plant at existing control levels and the levels required by the final standard. These risk estimates also reflect extension of the analysis out to 50 km (31 miles) from a plant and the use of 1980 census data.

The risk estimates were developed using the procedure described in Part I, *Risk Assessment Methodology,* of this preamble and a unit risk factor of 4.29 x $10^{-3}/\mu g-m^3$. The Agency determined that most of the emissions and risks were associated with 11 uncontrolled furnaces emitting more than 0.4 Mg/yr (0.44 tons/yr) each. These furnaces are located at 5 different plants. A sixth plant operating 9 uncontrolled furnaces, each emitting less than 0.4 Mg/yr (0.44 ton/yr) of arsenic, was also found to present relatively high aggregate risks. Because the proposed annual limit on uncontrolled arsenic emissions was set at 0.4 Mg/yr (0.44 ton/yr), none of the furnaces at this plant would have been subject to the proposed control requirements. However, risks to the population in the vicinity of a plant are a function of the emissions from an entire plant, rather than emissions from individual furnaces within a plant. Therefore, EPA considered whether the proposed annual limit should be lowered to include furnaces emitting less than 0.4 Mg/yr (0.44 ton/yr) when these furnaces contribute significantly to plant-wide emissions, and thereby to plant-wide risks.

The Agency also reviewed the availability of closer or more representative meteorological sites from those used in the proposal analysis. Meteorological experts within the Agency identified four sites in which more representative meteorological data were available, collected the data, and used it in the analysis which supports today's rulemaking. The plant sites involved are located in Dunkirk, Indiana; Baltimore, Maryland; Charleroi, Pennsylvania; and Moundsville, West Virginia.

Basis For Standard

As discussed in Part I of this preamble, the risk management approach provides a comprehensive assessment of candidate source categories, including the evaluation of current and applicable emission control alternatives, as well as the associated health risks, risk reductions, and costs and economic impacts. This section describes the application of this approach in the development of the standard for glass manufacturing plants. The points addressed here are: (1) Application of risk management approach including consideration of risks and the effectiveness and cost of control technology; and (2) selection of the format and the level of the final standard.

Application of Risk Management Approach

The standard that is being established today is based on the best technology which, in the Administrator's judgment, is available and can be applied without causing widespread plant closure or imposing costs that far exceed any public health benefit. Accordingly, the standard reflects consideration of the estimated risks, the costs and availability of further controls and the associated potential for risk reduction, and the potential societal impacts of regulatory alternatives. The following sections describe the principal factors considered in this decision.

Consideration of Effectiveness of Control Technology. At the time of proposal, it was believed that the most effective technology for control of arsenic emissions was identical to the best demonstrated technology for control of total particulate emissions from glass melting furnaces, fabric filter collectors and ESP's. This determination was based on data obtained from two tests on particulate control devices (one fabric filter and one ESP) installed on glass melting furnaces that use arsenic, which showed that at least 90 percent of the emitted arsenic was in the particulate matter and captured in the control devices. Because only arsenic emitted in the particulate matter can be controlled with existing technologies, and because most of the arsenic emitted from glass melting furnaces was believed to occur as particulate matter, it was concluded that application of the best systems for control of particulate matter would result in the maximum achievable control of arsenic emissions. Therefore, the Agency proposed to require affected sources to reduce emissions of total particulate to the levels required by the NSPS for glass manufacturing plants.

Data gathered by the Agency after proposal, and information supplied by commenters on the propsed standard, led to the conclusion that some furnaces would be able to meet the proposed emission limits without installing the most effective technology for control of arsenic emissions. For example, it was found that the largest arsenic emitting furnace, located in Martinsburg, West Virginia, could meet the proposed emission limit by reducing total particulate emissions by about only 45 percent. In this case, the corresponding reduction achieved in arsenic emissions would be no greater than 45 percent. In addition, data gathered from further EPA emission tests and emission test data supplied by industry representatives indicated that inorganic arsenic emissions from some glass melting furnaces may occur less predominantly in the particulate matter than previously believed. Therefore, a requirement that only emissions of total particulate be controlled would not guarantee that the most effective control of inorganic arsenic emissions would be achieved in all cases.

Prior to proposal, consideration was given to two alternative formats for the emission limits. One alternative considered was to establish a limit on the amount of arsenic emitted. This alternative was not adopted because the wide variability in the amount of arsenic added to the raw materials and the amount of arsenic retained in the product glass results in considerable variability in the amount of arsenic emitted from glass melting furnaces. Therefore, if the arsenic emission limit were set high enough to allow for the variability observed, the standard would not have resulted in application of the most effective control to all affected furnaces. Consideration was also given to an efficiency format that would require arsenic emissions to be reduced by a specific percentage. An efficiency format was not proposed because it was believed that a particulate emission limit would require the same level of control without the additional costs involved in measuring arsenic emissions at both the inlet and outlet of the control device.

In considering all of the available data, the Agency has concluded that, as believed at proposal, well-maintained and -operated ESP's and fabric filters represent the most effective technologies for controlling inorganic arsenic emissions from glass manufacturing plants. However, based on the data collected after proposal, the Agency has also concluded that the effectiveness of fabric filters and ESP's in controlling emissions of arsenic from glass melting furnaces can best be determined by measuring the efficiency of these control devices in reducing inorganic arsenic emissions. Only in this way can the Agency be assured that inorganic arsenic emissions from all affected furnaces will be reduced to the greatest extent possible. Therefore, the Agency believes that the additional costs involved in measuring the amount of arsenic at both the inlet and the outlet of the control device are warranted given the increased effectiveness of control that would be achieved by requiring emissions of arsenic to be reduced by a specific percentage.

As mentioned above, data made available after proposal have indicated that arsenic emissions from some glass melting furnaces may occur less predominantly as particulate matter. However, data collected during EPA emission testing and additional data supplied by industry representatives did not demonstrate any correlations between the proportion of arsenic emitted as particulate matter and the type of glass produced, the type of furnace used, or the type of arsenic added to the raw materials. In light of this finding, the EPA examined further whether cooling of the exhaust gases would cause gaseous arsenic emissions to condense and thereby increase the overall efficiency of particulate control devices in reducing total arsenic emissions. One emission test performed by EPA after proposal indicated that cooling of the furnace exhaust gas might increase the proportion of arsenic emitted as particulate matter, although the results were inconclusive. A subsequent emission test performed on the furnace located in Martinsburg, West Virginia, did clearly demonstrate that, for that furnace, arsenic removal efficiencies could be increased by cooling the furnace exhaust gas to a temperature of 121°C (250°F) or below.

The Agency also considered the performance of existing control devices in reducing emissions of inorganic arsenic. Available performance data for arsenic-using furnaces that are presently equipped with ESP's or fabric filters are shown in Table IV-2. The average efficiencies in controlling total arsenic emissions range from 92.6 percent to 99.7 percent. The relatively lower removal efficiency achieved by the fabric filter system installed on the furnace located in Central Falls, Rhode Island, is attributable to the fact that a relatively larger fraction of the arsenic emitted from this furnace was in the gaseous phase and not captured by the control device. The fabric filters at this plant achieved a greater than 99 percent removal efficiency of particulate arsenic emissions and the furnace exhaust gas is cooled to about 138°C (280°F) prior to entering the existing control system.

TABLE IV-2.—AVAILABLE ARSENIC EMISSION DATA FOR GLASS MELTING FURNACES WITH EXISTING CONTROL DEVICES

Plant Location	Furnace	Control device type [a]	Uncontrolled emissions (Mg/yr)	Controlled emissions (Mg/yr)	Average percent reduction
Danville, Kentucky	A	ESP	7.6	0.20	97.5
Charleroi, Pennsylvania	C	ESP	7.3	0.01	98.6
State College, Pennsylvania	A	ESP	6.9	0.02	99.7
Fall Brook, New York	A	ESP	3.1	0.05	98.5
	B				
	C				
Fall Brook, New York	C	ESP	3.8	0.07	98.0
	D				
Central Falls, Rhode Island	A	FF	2.6	0.19	92.6
Moundsville, West Virginia	A	ESP	1.7	0.04	98.7
Corning, New York	B	FF	0.6	0.04	94.0
Circleville, Ohio	A	ESP	0.6	0.03	95.0
	B	ESP	0.2	0.006	97.0

[a] ESP=Electrostatic Precipitator; FF=Fabric Filter.

Consideration of Costs and Economic Impacts. At the time of proposal, insufficient data were available to estimate the cost and economic impacts of applying controls to specific furnaces at specific glass manufacturing plants. To more accurately evaluate the cost and economic impacts associated with the final standard, detailed information was gathered on the largest emitting furnaces and the plants at which those furnaces are located. This information enabled the costs associated with alternative control options to be estimated for specific furnaces and the economic impacts to be estimated for the companies that operate those furnaces.

The detailed cost and economic analysis was conducted only for arsenic-using furnaces that are not presently equipped with ESP's or fabric filters. Total arsenic emissions from the 16 arsenic-using furnaces with existing control devices were estimated to be about 1.3 Mg/yr (1.4 tons/yr), or less than 5 percent of the emissions from the source category. Moreover, the available data indicate that arsenic emissions from these furnaces are presently being reduced to the maximum extent possible, although 4 furnaces were found to be emitting particulate emissions at levels higher than those required by the proposed standard. The costs of upgrading these control devices to meet the proposed emission limits were estimated and found to be excessive given that little, if any, incremental reduction in arsenic emissions could be achieved by further control. Therefore, the Agency concluded that it would unreasonable to require any additional control of arsenic-using furnaces equipped with existing fabric filters or ESP's, and no further cost or economic analysis was conducted for these furnaces.

Of the total 59 uncontrolled glass melting furnaces that use arsenic, about 90 percent of the emissions and risks are associated with 24 individual furnaces. Therefore, the cost and economic impacts of applying controls to these 24 furnaces were investigated. The 24 furnaces are located at 6 separate glass manufacturing plants and are owned and operated by 3 different companies.

The costs of controlling arsenic emissions from the six plants are shown in Table IV-3. Capital costs were calculated to range from about $2,239,000 to $4,650,000. Annualized costs were calculated to range from about $450,000 to $940,000. Assuming that the costs of controls are absorbed by the companies operating these furnaces (i.e., control costs are not passed on to consumers), the estimated decline in profit ranges from less than 5 percent to more than 30 percent. A decline in profit of 15 percent or more is considered by the Agency to be significant, and could result in the closure of a furnace. A more detailed discussion of the cost and economic analysis is provided in Appendix B of the BID.

TABLE IV-3.—COSTS OF CONTROL AND ECONOMIC IMPACTS

Plant	Number of uncontrolled furnaces	Uncontrolled emissions (milligrams per year)	Capital cost ($1,000)	Annual cost ($1,000 per year)	Decline in profit (percent)
Martinsburg, Virginia	1	13.3	2,634	533	<5
Dunkirk, Indiana	[1] 9	7.6	2,979	597	15-30
Charleroi, Pennsylvania	1	3.4	2,628	531	30-50

TABLE IV-3.—COSTS OF CONTROL AND ECONOMIC IMPACTS—Continued

Plant	Number of uncontrolled furnaces	Uncontrolled emissions (milligrams per year)	Capital cost ($1,000)	Annual cost ($1,000 per year)	Decline in profit (percent)
Shreveport, Louisiana	3	2.4	2,746	556	5–15
Toledo, Ohio	[2] 9	1.6	4,650	938	5–15
Corning, New York	1	0.8	2,239	451	15–30

[1] Four furnaces at plant each emit less than 0.4 Milligrams per year of arsenic; no controls were assumed to be applied to these four furnaces.
[2] All nine furnaces at plant each emit less than 0.4 Milligrams per year of arsenic; controls were assumed to be applied to all nine furnaces.

As mentioned above, cooling of the exhaust gases from glass melting furnaces may, in some cases, be necessary to achieve the best control of arsenic emissions. Because cooling of the exhaust gases may result in corrosion of the metal surfaces in an emission control system, the costs of installing systems to remove corrosive substances (dry scrubbers) from the exhaust gas were also estimated (A–83–08/IV–B–14). The use of dry scrubbing systems was found to increase annualized control costs by 40 to 50 percent above those for an ESP or fabric filter alone. However, no existing furnaces affected under the promulgated standard would need to install dry scrubbing systems.

Consideration of Risks. In reaching the decision on the standard, the Administrator considered of particular importance the present magnitude of estimated risks and the degree to which risks can be reduced by control measures which are available.

The magnitude of the reduction in risk achievable by application of control technology was determined by comparing the maximum individual risk and the annual incidence before control to the residual risks remaining after control. Any changes in the emission source characteristics caused by the application of controls, such as exhaust gas cooling, were considered in the estimates of residual risks. The accuracy of the exposure analysis was evaluated by comparing the results obtained from alternative dispersion models and, where possible, by comparing the modelled concentrations to the concentrations actually measured near specific sites.

Estimated Risk—Using the approach and procedures described above, the maximum lifetime risks and the annual incidence prior to control were calculated for the six highest emitting plants. Over 90 percent of the total arsenic emissions from the source category arise from the 24 individual melting furnaces operated at these 6 plants. The residual risks that would remain if emissions from these plants were controlled to the maximum extent possible were then estimated.

The results of the risk analysis are summarized in Table IV–4. Maximum lifetime risks prior to control range from a low of about 0.3×10^{-4} for the plant located in Corning, New York to a high of about 9×10^{-4} for the plant located in Dunkirk, Indiana. Annual incidence was determined to range from 0.005 per year to 0.12 per year. With the exceptions of the highest emitting plant and the lowest emitting plant, the magnitude of the risks were found not to correlate directly with the magnitude of the emissions. This finding reflects the sensitivity of risk to the physical charcteristics of the emission source as well as to the location of the population with respect to the emission source.

TABLE IV-4.—BASELINE RISKS AND RESIDUAL RISKS AFTER CONTROL OF GLASS MANUFACTURING PLANTS WITH HIGHEST ARSENIC EMISSIONS

Plant	Number of uncontrolled furnaces	Uncontrolled arsenic emissions (Manufactured/year)	Prior to control		After control		
			Maximum risk (X 10^{-4})	Annual incidence	Maximum risk (X 10^{-4})	Annual incidence	Reduction in annual incidence
Martinsburg, West Virginia	1	13.3	8	0.12	0.5	0.013	0.11
Dunkirk, Indiana	[1] 9	7.6	9	0.038	1.7	0.0085	0.03
Charleroi, Pennsylvania	1	3.4	4	0.11	0.2	0.012	0.10
Shreveport, Louisiana	3	2.4	0.7	0.035	0.06	0.0037	0.03
Toledo, Ohio	[2] 9	1.6	3	0.07	0.09	0.0066	0.059
Corning, New York	1	0.8	0.3	0.005	0.14	0.0016	0.003

[1] Four furnaces at plant each emit less than 0.4 Mg/yr of arsenic; no controls were assumed to be applied to these four furnaces.
[2] All nine furnaces at plant each emit less than 0.4 Mg/yr of arsenic; controls were assumed to be applied to all nine furnaces.

The estimated reduction in annual incidence achievable through the application of emission controls were found to range from less than 0.01 per year to more than 0.10 per year. The estimated reduction in annual incidence achievable from the plants located in Martinsburg, West Virginia, and Charleroi, Pennsylvania, were found to be three to four times greater than the reduction in annual incidence achievable from the other four plants. Because emission test data gathered at the Martinsburg plant indicated that cooling of the furnace exhaust gas would result in more effective control of arsenic emissions, residual risks were estimated for a control system that included gas cooling.

Validation of the Exposure Estimates—The EPA has used HEM to estimate exposure and risks associated with the glass plants. However, similar to what the Agency did in the case of the primary copper smelter source category, EPA has validated its HEM exposure assessment of the glass plants in several ways. First, at two sites, EPA has conducted a more site-specific air quality modeling analysis and compared the results to the concentration profiles that are predicted by the HEM dispersion model. In the original HEM analysis, EPA did not consider terrain effects or the full effect of building downwash on stack emissions from glass manufacturing plants. Glass plants often have short stacks that cause effluents to be entrained in the building wake on the leeward side of the furnace buildings or other adjacent structures. As a consequence, it was regarded as likely that airborne arsenic concentrations to which people might be exposed near these plants could be underestimated. In addition, it was felt that the extent of building downwash could be expected to be different depending on the temperature of the gas stream exiting the control device. If so, the relative reduction in risk achieved would be affected. For these reasons, more sophisticated dispersion analyses were carried out for two glass plant locations: Martinsburg, West Virginia, and Shreveport, Louisiana. These two plants were selected because of availability of representative meteorological data that were collected at monitoring stations near the plants and because of the availability of some limited ambient monitoring data to which the modeling results could be compared. Although the concentrations predicted by HEM were somewhat higher, generally the HEM and the site-specific analyses provided comparable results.

Where possible at other glass plant sites, the Agency has validated the results of the air dispersion models by comparing the modeled concentrations to ambient concentrations measured near the plants. Ambient data in sufficient quantities to make limited comparisons were found at four glass plant sites. Generally, EPA's dispersion modeling estimates were close to the measured concentrations or were overpredictions of the measured concentrations. However, much of the available data were below the detection limit of the sampling and analytical techniques used in the ambient monitoring program, thus, limiting the usefulness of the comparison.

Selection of Standard

Based on EPA's interpretation of section 112, as previously discussed in Overview—Basis for Promulgated Standards, the following factors were considered in the selection of the standard: (1) The magnitude of the risks; (2) the costs and availability of further controls; and (3) the potential economic and social impacts of the alternatives.

Applicability of the Standard. In assessing the need for further control, the risks and control cost estimates for the six plants with the highest uncontrolled emissions were considered. These estimates are shown in Tables IV–3 and IV–4. The cost control at each of the six plants is similar except for the Toledo, Ohio, plant which has an estimated annual control cost approximately double the others. In contrast, the estimated risks and risk reduction potential varies widely among the six plants. The reduction in annual incidence achievable from plants located in Martinsburg, West Virginia, and in Charleroi, Pennsylvania (from Table IV–4), is three to four times greater than the reduction in annual incidence achievable from the other four plants.

Based on a consideration of these risk and cost data, it was concluded that further control should be required at the Martinsburg and Charleroi plants. However, at the other four plants where risk and achievable risk reduction potential are lower, it was concluded that further control is not necessary, and if required, would impose costs which are disproportionately high compared to the benefits of reducing the estimated current risks. Accordingly, the promulgated standard establishes an annual emission limit on uncontrolled arsenic emissions from existing glass melting furnaces that would require only the plants located in Martinsburg, West Virginia, and Charleroi, Pennsylvania, to install add-on control technology. Because emissions from these two plants arise from a single uncontrolled furnace having emissions higher than any furnace at the other plants, and because no furnaces at any of the other plants emit more than 2.5 Mg (2.75 tons) per year of arsenic, the limit on uncontrolled emissions of arsenic for existing glass melting furnaces is established at 2.5 Mg/yr (2.75 tons/yr). In establishing this limit, the estimated economic impact of applying controls to the plant located in Charleroi, Pennsylvania, was given particular consideration because the economic analysis indicated that possible closure would result. However, representatives of the firm that owns this plant indicated that they do not intend to produce an arsenic-containing glass in this furnace in the future (A–83–08/IV–E–58). Therefore, the Agency concluded that establishing the limit at 2.5 Mg/yr (2.75 tons/yr) would not result in adverse economic impacts. The EPA has also identified six other glass melting furnaces with uncontrolled inorganic arsenic emissions of more than 2.5 Mg/yr (2.75 tons/yr). However, all six of the furnaces are presently equipped with the control technology that would be necessary to meet the promulgated emission control requirements, and, as discussed below, are not expected to need any additional control to demonstrate compliance.

The selected uncontrolled emission limit of 2.5 Mg/yr (2.75 tons/yr) applies only to existing glass melting furnaces that use commercial arsenic. For new or modified furnaces, the proposed limit of 0.4 Mg/yr (0.44 tons/yr) of uncontrolled arsenic emissions has been retained in the promulgated standard. It is not feasible to establish an emission limit for new or modified glass melting furnaces on the basis of risk because it is impossible to characterize the factors that affect risk estimates for glass furnaces that do not presently exist, or do not at present use arsenic. The risks associated with emissions of arsenic are a function of the amount of arsenic emitted, the specific physical parameters of the emission source (i.e., stack height, exhaust gas temperature, and velocity, etc.), and the location of the emission source with respect to the surrounding population. The Agency does not anticipate that any new arsenic-using furnaces will be built, or that any furnaces that do not at present use arsenic will do so in the future. Since proposal, the use of arsenic in some glass melting furnaces has been eliminated and the Agency believes that this trend is likely to continue. The companies that operate these furnaces have indicated that they do not plan to resume using arsenic. The cutoff applied to new or modified glass melting furnaces is based on consideration of cost and economic factors and has been retained in the promulgated standard to discourage reintroduction of arsenic in furnaces that have recently eliminated its use and to discourage future use. The Agency believes that this is appropriate to prevent risks from increasing near those furnaces that have recently eliminated arsenic use and because reasonable alternatives to exceeding this cutoff level are available at these facilities. These include the use of low-arsenic glass recipes and the use of controlled furnaces for production of those glass types which would result in uncontrolled emissions of arsenic of more than 0.4 Mg (0.44 ton) per year.

Format and Level of the Standard. As discussed above under Consideration of the Effectiveness of Control Technology, EPA believes that well-maintained and operated ESP's and fabric filters represent the most effective technologies for controlling emissions of arsenic from glass manufacturing plants. However, based on information and data made available after proposal, the Agency has determined that a standard requiring arsenic emissions to be reduced by a specific percentage is necessary to ensure that these control devices are applied and operated in a manner that best reflects their full effectiveness in controlling arsenic emissions.

Consideration was given to applying the percent reduction requirement to emissions of particulate arsenic rather than total arsenic. This option was considered because only arsenic emitted as particulate matter can be collected by ESP's and fabric filters. However, emission test data have indicated that for some glass melting furnaces only a relatively small proportion of the emitted arsenic occurs as particulate matter. In these cases, a control requirement based on a percent reduction in particulate arsenic would result in some furnaces meeting the standard without reducing emissions of total arsenic to the maximum extent possible. Also, the results obtained from a recent test on a glass melting furnace (summarized in Appendix A of the BID) indicated that the Test Method 108 sampling train may not provide a reliable indication of the ratio of particulate arsenic emissions to gaseous arsenic emissions in instances where the concentration of gaseous arsenic is sufficiently high to be sensitive to gas stream temperature. Therefore, measurements of particulate arsenic, as opposed to total arsenic, may be subject to error in some instances and may not provide an accurate indication of the degree of emission reductions achieved in all cases. For these reasons, the Agency concluded that the standard should be based on the reductions of total arsenic achievable through the application of ESP's and fabric filters.

As the data from furnaces with existing control devices demonstrate (see Table IV–2), the efficiency of a given control device in reducing total arsenic emissions may not be obtained by a similar device installed on a different glass melting furnace. The variability observed in removal efficiency is primarily a function of the proportion of arsenic emitted as particulate matter. As discussed above, no correlations have been identified between the proportion of arsenic emitted as particulate matter and the type of glass produced, the type of glass melting furnace employed, the type of arsenic added to the raw materials, or other process characteristics. Although the available data do indicate that cooling of the furnace exhaust gas prior to entering a control device can sometimes be effective in increasing the proportion of arsenic emitted as particulate matter, sufficient data are not available to predict quantitatively the extent to which cooling will increase the effectiveness of control. As a result of these uncertainties, available data on the efficiencies of existing control devices in controlling total arsenic emissions cannot be generalized to glass melting furnaces that are not presently controlled. Therefore, the degree of emission reduction achievable from the two uncontrolled furnaces emitting more than 2.5 Mg/yr (2.75 tons/yr) of arsenic were also investigated.

Available emission test data for the furnace located in Charleroi, Pennsylvania, showed that the fraction of total arsenic emitted from this furnace in the particulate phase ranges from about 89 to 95 percent. Assuming that the stack gas sampling system used in these tests accurately measured the ratio of particulate arsenic to gaseous arsenic, control efficiencies for total arsenic of from 89 to 95 percent would be expected. However, because EPA expects that no arsenic will be used in this furnace in the future, no further analysis of the arsenic control efficiencies achievable for the Charleroi furnace was performed.

Emission test data supplied by Corning Glass Works on the furnace located in Martinsburg, West Virginia, showed wide variability in the proportion of arsenic emitted from the furnace as particulate matter. Data collected over a five-year period indicated that the proportion of arsenic emitted as particulate matter ranges from a low of about 30 percent to a high of about 100 percent. Wide variability was observed even for tests performed on the same day, under stable operating conditions. Because the available data on the Martinsburg furnace did not provide the Agency with any clear indication of the arsenic removal efficiencies achievable from this furnace, additional testing was performed by EPA. Simultaneous with the EPA tests, Corning conducted a series of performance tests on a pilot-scale fiber filter system that was installed on the furnace. In reviewing the data from these tests, it was concluded that cooling of the furnace exhaust gas to a temperature of approximately 121 °C (250 °F), or below, was effective in increasing the efficiency of the pilot-scale fabric filter in reducing emissions of arsenic. When the control device was operated at temperatures above 121 °C (250 °F), control efficiencies ranged from about 58 percent to 82 percent and averaged 71 percent. Control efficiencies at temperatures below 121 °C (250 °F) ranged from 75 percent to 97 percent and averaged 87 percent. The variability observed in these results reflects the fact that the operating conditions of both the furnace and the control device were variable over the course of the test program.

The operating condition that exerted the greatest influence on the percentage of arsenic reduced across the control device was the production rate of the furnace. As the production rate decreased, the concentration of particulate arsenic in the gas entering the control device also decreased. The concentration of gaseous arsenic at the inlet of the control device did not decrease at lower production rates. Because proportionally less arsenic entered the control device in particulate form at lower production rates, the percentage of the total arsenic captured by the control device decreased. However, the total concentration of arsenic in the gas leaving the control device remained constant at all furnace production rates. Therefore, although the efficiency of the control device decreased with decreasing production rate, the production rate of the furnace did not affect the amount of arsenic emitted to the air. A detailed summary of these tests is provided in Appendix A of the BID.

In selecting the level of the final standard, the Agency considered the performance of existing control devices installed on arsenic-using glass furnaces in reducing arsenic emissions, the factors affecting control device performance, the control efficiencies achievable for uncontrolled furnaces that would be required to install controls, and the cost and economic impacts of control. As reviewed above, the performance of ESP's and fabric filters installed on existing furnaces demonstrate that efficiencies of between about 92 percent and 99 percent are achievable. However, in considering the factors affecting performance, the Agency determined that no basis exists for concluding that existing control devices with relatively lower arsenic removal efficiencies could achieve higher removal efficiencies by modifying either the design or the operation of the control system. In addition, the costs of modifying any existing control systems would be disproportionate to the incremental reductions in arsenic emissions that might be achieved, even if there were reason to believe that these modifications would increase the effectiveness of control. Therefore, the Agency concluded that the final standard should be set at a level that would not require any additional control of furnaces equipped with existing control devices. In considering the data gathered from the emission tests on the uncontrolled furnace located in Martinsburg, West Virginia, the Agency concluded that the level of control achievable within the range of production rates typical for this furnace would be an 85 percent reduction in total uncontrolled arsenic emissions. Because the Agency also believes that all furnaces with existing control devices affected under the emission cutoff are capable of achieving an 85 percent reduction in total arsenic emissions without installing any additional control, the level of the final standard was set at 85 percent.

The Agency believes that the level of the final standard will ensure that the most effective technology for reducing emissions of arsenic will be applied to the furnace that will be required to install add-on controls as a result of this regulation. Because the factors affecting the performance of particulate control devices in reducing emissions of arsenic are variable and cannot be accurately predicted, any control device installed as a result of this rulemaking can reasonably be expected to be designed and operated in a manner that ensures the most effective possible control under all furnace operating conditions. Therefore, the Agency concluded that setting the standard at a level higher than 85 percent would not result in the application of control technology any more effective than that which would be applied to reduce emissions by 85 percent. If the level of the standard were set at a higher level, however, the probability that a source may fail to demonstrate compliance would be correspondingly higher, without providing any additional environmental benefit. The Agency believes that reductions in arsenic emissions of at least 90 percent will be typically achieved by all existing controlled furnaces affected by the standard. To ensure that the intent of the standard is not circumvented by any existing or future source, provisions are included in the final regulation that prohibit the application of controls to only a portion of the furnace exhaust gas. This provision will prevent the installation of partial controls on those furnaces where all of the arsenic is emitted as particulate matter under all furnace operating conditions, and an overall 85 percent reduction could be achieved by applying controls to only a portion of the furnace exhaust gas.

The final standard does not require cooling of furnace exhaust gases to any specific level prior to entering a control device. The Agency has no basis for determining under what conditions cooling would be effective in increasing control device performance or for predicting the extent to which cooling might increase performance. Therefore, a requirement that the exhaust gas from all affected furnaces be cooled to some specific level prior to entering a control device would result in increased costs with no guarantee that additional arsenic emission reductions would be achieved. The Agency believes that both the level and the format of the final standard are sufficient to ensure that furnace exhaust gases are cooled in those instances where the effectiveness of control is dependent on the operating temperature of the control device. In the case of the furnace located in Martinsburg, West Virginia, the Agency expects that the temperature of the furnace exhaust gas will be cooled to below 121 °C (250 °F) prior to entering the control device. The final standard includes provisions for continuous monitoring and recording of the operating temperature of a control device to ensure that the temperature maintained during the emission test to demonstrate compliance is also maintained thereafter.

Discussion of Comments

Comments on the proposed standard were received from 20 interested parties, and three speakers commented on the proposed standard for glass manufacturing plants at the public hearing. In addition, four comment letters were received on the March 20, 1984, **Federal Register** notice regarding options proposed by EPA for controlling emissions from furnaces producing soda-lime glass and calculating zero production offsets. The following sections summarize the Agency's responses to the major comments and the consideration given these comments in formulating the standard being established today.

Applicability

Several commenters raised questions about the applicability of the regulation to glass manufacturing plants, both generally and with respect to specific circumstances. The major issues raised by the commenters concerned the consideration of risk in establishing an emissions cutoff, the applicability of the regulation of furnaces that are at present equipped with add-on control devices, the applicability of the regulation to emissions arising from trace impurities of arsenic in non-arsenic raw materials, the reliance on OSHA standards for controlling fugitive emissions of arsenic, and the applicability of various allowances and exemptions.

Selection of Annual Uncontrolled Emission Limit. One commenter (the New Jersey Department of Environmental Protection) stated that the proposed arsenic emission limit of 0.4 Mg/yr (0.44 ton/yr) for uncontrolled emissions was based entirely on cost and economic factors, with no consideration given to the risks associated with these emissions.

At the time of proposal, the Agency's standard setting approach involved first selecting a standard that was achievable through the application of best available technology (BAT). Determination of BAT was based on the capability of existing technologies to reduce emissions, as well as on the costs of emission controls and on the economic impact of applying the controls at specific facilities. The residual risks remaining after application of BAT to furnace that would have been affected by the proposed limit (0.4 Mg/yr of arsenic prior to control) were then considered to determine if a more stringent standard would be necessary to protect public health. The Agency determined that eliminating the 0.4 Mg (0.44 ton) per year exclusion level would not affect the estimated maximum lifetime risk and would have negligible effect on estimated cancer incidence. Since proposal, Agency policy has evolved to place greater emphasis on risk and risk reduction in determining which specific sources within a source category shall be subject to an emission limit under section 112. Costs and economic impact are still considered in relation to the reductions in risk achievable through the use of selected control technologies.

Because of various site-specific factors, the degree of risk associated with inorganic arsenic emissions from glass manufacturing plants does not, in all cases, directly correlate with the absolute magnitude of those emissions. For instance, a fugitive emission source with a relatively low emission rate released relatively close to the ground may have a similar air quality impact as a stack with a higher emission rate and a higher point of release. Moreover, risks to the population in the vicinity of a plant must be assessed in terms of emissions of inorganic arsenic from an entire plant, rather than emissions from individual furnaces within a plant. Therefore, in establishing an emission cutoff, the emphasis has shifted from consideration of the magnitude of the emissions arising from individual furnaces, and the costs of controlling those emissions, to consideration of the magnitude of the risks associated with specific plants and the degree to which those risks can be reduced at a reasonable cost. The application of this policy in developing the final standard was described above under Selection of Standard.

Applicabilty to Furnaces with Existing Control Devices. One commenter representing Corning Glass Works stated that all glass melting furnaces that are currently equipped with add-on control technology should not be required to install additional control. The commenter indicated that the largest and most cost-effective reductions in arsenic emissions could be obtained from furnaces that are currently uncontrolled.

The promulgated emission limit requiring 85 percent reduction of arsenic emissions applies to all existing glass melting furnaces that emit more than 2.5

Mg/yr (2.75 tons/yr) of arsenic prior to an add-on control device. Thus, furnaces with existing control devices must achieve this limit if emissions of arsenic from these furnaces would be more than 2.5 Mg/yr (2.75 tons/yr) if controls were not in place; EPA is aware of 6 such furnaces. Available emission data indicate that arsenic emissions from each of these furnaces are currently being reduced by more than 85 percent; therefore, demonstration of compliance should be possible without installation of additional control.

Trace Amounts of Arsenic in Raw Materials. Three commenters, including the Glass Packaging Institute, addressed the issue of whether the presence of arsenic as an impurity in the raw materials used to manufacture glass should be considered in determining the applicability of the standard. Each of these commenters expressed concern that it would be burdensome and costly to require facilities that do not use arsenic as a raw material to demonstrate that emissions arising from trace arsenic contamination of other raw materials would not result in exceedance of the proposed annual uncontrolled emission limit of 0.4 Mg per year (0.44 ton per year). The commenters requested that EPA explicitly exclude from the promulgated regulation all furnaces that do not intentionally use arsenic as a raw material. One commenter noted that the arsenic content of raw materials is not routinely specified by raw material suppliers since arsenic is not known to impair glass quality. However, the commenter indicated that in a telephone survey of glass manufacturers and raw material suppliers, no evidence was found that arsenic exists in significant quantities as an impurity of raw material components. The only detectable quantity of arsenic was found in Green River soda-ash concentrations ranging from 0.03 to 0.5 ppm. These concentrations would result in maximum uncontrolled arsenic emissions of about 1.1 kilogram (2.5 pounds) per year from a typical 225 Mg/day (250 ton/day) glass container furnace. This commenter concluded that EPA should give no consideration to the arsenic content of raw materials since there is no reason to believe that the arsenic content of raw materials used for glass manufacture is any higher than it is raw materials used in other process industries. Another commenter, however, pointed out that for the size of furnace typically used to produce flat glass (450 to 545 Mg/day [500 to 600 tons/day]), trace amounts of arsenic in the raw materials on the order of 2 to 3 ppm by weight could result in uncontrolled arsenic emissions approaching the proposed emission cutoff of 0.4 Mg/year (0.44 tons/yr). The commenter is aware of only one conventional raw material that contains arsenic as an impurity. That one exception, an additive used in small amounts in producing body-colored glass, would result in arsenic emissions of less than one pound per year.

The EPA has examined the problems posed by the presence of arsenic as an impurity in various raw materials used in the production of glass, and has concluded, based on available information, that this source of arsenic is not expected to affect significantly the emissions of inorganic arsenic from glass manufacturing furnaces. The specific comment that appears to indicate that the presence of arsenic impurities may result in emissions approaching 0.4 Mg (0.44 ton) per year was closely examined. It was determined that the calculations present an unrealistic situation in presuming that all of the raw materials entering the furnace contain 2 to 3 ppm arsenic by weight, and that all of the arsenic entering the furnace is emitted. Because it would be uncommon for all raw materials to contain arsenic at that level, and because at least 70 percent of the arsenic is expected to be retained in the product, EPA has concluded that the emissions calculated in the example given in the comment are substantially overstated and not indicative of an actual condition that might occur.

The EPA has also independently investigated the concentration of arsenic found in the bulk raw materials commonly used in the glass industry (A-83-08/IV-B-12). During an emission test of an arsenic-using furnace, samples of the bulk raw materials were taken and analyzed for arsenic content. With the single exception of barium carbonate, the concentrations of arsenic in the raw materials from this plant were below the detection limits of the analytical method used. The measured concentration of arsenic in the barium carbonate sample was 2.32 ppm. However, barum carbonate is not widely used in large quantities within the glass industry. Even assuming that the concentration of arsenic in bulk raw materials is equal to the detection limit of the analytical methods used on the test samples, the maximum uncontrolled emissions of arsenic arising from raw material impurities would be about 0.19 Mg/yr (0.21 ton/yr) from a furnace producing 500 Mg/day (550 tons/day) of glass.

Based on all of the information available to the Agency, glass melting plants that do not use commercial arsenic as an ingredient of their batch composition would not emit enough arsenic to be affected by the promulgated uncontrolled emission limits of 0.4 Mg (0.44 ton) per year for new and modified furnaces and 2.5 Mg (2.75 tons) per year for existing furnaces. The EPA agrees it would be unreasonable to require demonstration of this; and, therefore, the applicability section of the promulgated regulation has been revised to exclude all furnaces that do not use commercial arsenic as a raw material. Commercial arsenic is defined as any form of arsenic that is produced by extracting arsenic from any arsenic-containing substance and is intended for sale or for intentional use in a manufacturing process.

Fugitive Emissions. The NRDC representative objected to EPA's reliance on compliance with OSHA standards for fugitive emissions of inorganic arsenic in the workplace. The NRDC felt it was not appropriate to consider OSHA standards in deciding not to propose standards for these emissions. The commenter stated that: (1) This reliance was based solely on statements made by company representatives, and had not been independently verified by the Agency; (2) although OSHA standards, if implemented, may provide protection to workers in glass manufacturing plants, they do not give persons living around the plants the enforcement power to compel compliance with the standards that would be available under the Clean Air Act; and (3) the Agency should, at the least, incorporate into a section 112 standard the equipment and work practice requirements needed to comply with the OSHA standards.

The Administrator believes that where standards established under separate authorities are effective in reducing emissions, redundant standards need not be established by EPA. The Agency establishes separate standards when there is evidence that either the control measures are not likely to remain in place or are unlikely to be properly operated and maintained. The EPA has again reviewed the emission sources at glass manufacturing plants to determine any need for controls beyond those required by OSHA.

Information gathered after proposal during visits to glass plants that use arsenic indicated that fugitive emissions from some plants may not be controlled. As a result of this finding, EPA has estimated the magnitude of the emissions of inorganic arsenic that could arise from fugitive sources within glass manufacturing plants (A-83-03/

IV-B-11). These estimates were based on published fugitive emission factors for various material handling operations, as well as on data gathered during visits to glass plants that use arsenic. To be conservative, "worst case" conditions were assumed in estimating potential fugitive arsenic emissions. For example, in this analysis it was assumed that the plant uses unusually high concentrations of arsenic (7 kg/Mg [14 lb/ton]) in the batch raw materials. The major potential source of fugitive particulate emissions at glass manufacturing plants are the material handling operations associated with the unloading, storage, and weighing of the bulk raw materials. However, arsenic is not present during these operations. Arsenic is added later, just prior to mixing the batch. Fugitive emissions of arsenic could occur during mixing of the batch materials, during the transfer of these materials to the furnaces, when the materials are charged into the furnace, and when control devices (if used) are emptied and the waste products are removed for disposal or recycled to the melting furnace. In considering all of the possible sources of fugitive emissions from glass manufacturing plants, and employing the best information currently available to the Agency, the EPA estimated that the maximum fugitive emissions of arsenic from a large, 545 Mg per day (600 tons per day), plant would amount to 0.21 Mg/yr (0.23 ton/yr) if emission control devices were not used. For a plant of this size, uncontrolled stack emissions would be about 145 Mg/yr (160 tons/yr). The same plant, if controlled, would emit about 7 Mg/yr (8 tons/yr) out of the stack(s); fugitive arsenic emissions from a 545 Mg/day (600 tons/day) controlled plant were estimated to be 0.33 Mg/yr (0.36 ton/yr) under worst case conditions. Because all of the plants known to use arsenic have capacities less than 545 Mg/day (600 tons/day), and because the estimates summarized above are based on "worst case" assumptions, the EPA has concluded that fugitive emissions of inorganic arsenic from glass manufacturing plants are negligible, and, hence, risks are expected to be small; thus, fugitive emissions are not expected to endanger public health. Therefore, the promulgated standard neither requires controls for fugitive inorganic arsenic emissions at glass manufacturing plants nor incorporates OSHA requirements into the promulgated standard as suggested by the commenter.

Allowances and Exemptions. One commenter representing Corning Glass Works requested that the EPA include provisions for conducting normal maintenance on control devices. Most glass furnaces operate continuously for a period of years, while emission control devices require frequent maintenance. The commenter stated that the maintenance requirement on an electrostatic precipitator is about 144 hours per year and that provisions should be made for by-pass of the control device while maintenance is being conducted.

The EPA has investigated the cost and environmental impacts associated with performing routine maintenance on emission control devices installed on affected glass furnaces (A-83-08/IV-B-10). Two alternatives were considered. The first alternative would be to require the glass furnace to shut down during these maintenance periods in order to avoid uncontrolled emissions of arsenic. The second alternative would allow furnace operators to by-pass the control device for a limited period of time for maintenance purposes. Emissions of arsenic during these periods would not be controlled. The EPA analysis compared the increase in the cost incurred by a model manufacturing plant that would result from the first alternative to the increase in emissions that would follow from the by-pass alternative. In this analysis both large and small furnaces and high and low glass production costs were considered. In total, the cost and environmental impacts associated with the alternative requirements were evaluated for eight different cases.

In the first four cases, the impacts were calculated for two furnace sizes (45 and 136 Mg/day [50 and 150 tons per day]) and for two levels of specific arsenic emissions (0.025 kg/Mg of glass produced and 0.05 kg/Mg of glass produced [0.05 lb and 1.00 lb ton/of glass]). In the first four cases, relatively low glass production costs were assumed, on the order of $0.75/kg ($0.34/lb) of product. The second four cases assumed the same furnace sizes and specific arsenic emission rates, but were based on the assumption of a glass with higher production costs of $4.19/kg ($1.90/lb). These values represent the low and high end of the ranges for actual glass furnaces that use arsenic. In all cases, it was assumed that the time required for maintenance of control devices is 144 hours per year.

The results of this analysis showed that a large furnace with a high arsenic emission rate could emit up to 0.41 Mg (0.45 ton) of arsenic during the 144 hours that the control device is by-passed. Small furnaces with low arsenic emission rates would emit 0.01 Mg (0.01 ton) of arsenic during this maintenance period. The annual costs of furnace shutdown were estimated to range from a low of $63,000 for a small furnace producing a low-cost glass, to a high of $1,000,000 for a large furnace producing a high-cost glass. Thus, the cost effectiveness of requiring all arsenic-using furnaces to be shut down while maintenance is carried out on emission control devices would range from about $463,000 per Mg ($420,000 per ton) of arsenic removed to over $51,800,000 per Mg ($47,000,000 per ton) of arsenic removed.

Because the economic impacts of requiring furnaces to be temporarily shut down while maintenance is performed on emission control devices would be excessive in some cases, and because the use of well-maintained control devices is essential in effectively controlling arsenic emissions on a continuing basis, the promulgated standard allows emission control devices installed on furnaces affected by the standard to be by-passed for purposes of conducting necessary maintenance. The EPA has also determined, however, that inorganic arsenic emissions from glass melting furnaces can be reduced by implementing certain work practices during maintenance periods. Therefore, each owner or operator of an affected furnace who needs to by-pass the control device for maintenance purposes is required to submit a plan to the Administrator that details (1) the length of time it will be necessary to by-pass the control device; (2) the emissions of arsenic that would occur during maintenance periods if no steps were taken to reduce them; (3) the procedures and work practices that will be implemented to minimize arsenic emissions during maintenance periods; and (4) the expected reduction in emissions of arsenic achieved by the implementation of these procedures and work practices. Only after approval by the Administrator of this plan will the by-pass of an emission control device by allowed.

In some cases, emissions of inorganic arsenic can be prevented entirely while control devices are undergoing maintenance. For example, control device maintenance should be scheduled during periods of normal furnace shutdown whenever possible. For some plants, it may be feasible to switch production temporarily during periods of control device maintenance to glasses that do not contain arsenic. All facilities affected by the regulation should make maximum use of control devices that are divided into two or more independently operated sections. Use of so-called "sectionalized" control devices enables maintenance to be performed on one section of the device without affecting the operation of the other(s). Other steps that can be taken to minimize emissions of inorganic arsenic during maintenance of control devices are the maximum use of cullet, the temporary reduction in arsenic feed, or the temporary reduction of furnace output.

Format of the Standard

Two commenters on the proposed regulation stated that using the emission rates for total particulate allowed under the standard of performance for new sources (NSPS) as the basis of the control requirement for an arsenic NESHAP would lead to numerous problems in demonstrating compliance with the regulation. Corning Glass Works provided several examples in which multiple furnaces, each melting a different type of glass, are exhausted to a common stack. Because the proposed emission rates were different for different glass types, the commenter felt that it would be virtually impossible to determine compliance for each possible combination of furnaces and glass types. The commenter also noted that some furnaces currently equipped with the best control technology available would not comply with the proposed emission rates for total particulates. The New Jersey Department of Environmental Protection recommended that the Agency establish an efficiency standard for arsenic removal, rather than an emission rate for total particulate matter.

In carefully evaluating all of the comments and available data, the Agency has determined that a control requirement based on a percent reduction of arsenic emissions is preferable to a limit on emissions of total particulates from glass melting furnaces. Some furnaces in the pressed and blown segment of the industry are used to melt various types of glass. The type of glass being melted in these furnaces may change frequently, causing a corresponding change in particulate emission rates. No satisfactory approach could be developed for determining compliance with a particulate emission rate on a continuing basis under these circumstances, or for prorating emissions from multiple furnaces that exhaust to a common stack. The EPA has also found that particulate emission rates from arsenic-using furnaces that are currently uncontrolled are, in some instances, significantly less than would be normally expected. Thus, these furnaces could conceivably meet the proposed particulate emission limit by reducing particulate emissions by as little as 45 percent. In this case, the corresponding reduction achieved in arsenic emissions would be only 40 to 45 percent, even though all of the emitted arsenic may be in the particulate matter. Therefore, EPA has found that control equipment that would meet the proposed particulate emission limits may not, in all instances, represent the most effective control technology for arsenic emissions. Finally, EPA has assembled all of the available data on control devices currently installed on arsenic-using glass furnaces. Many of these control devices achieve more than 95 percent reduction in total arsenic emissions, although some of them are not capable of reducing emissions of total particulates to the level prescribed by the NSPS. The costs of upgrading these control devices to meet the NSPS particulate emission rates were investigated and found to be excessive when compared to the additional reduction in arsenic emissions that would be achieved. There is one disadvantage of an emission limit based on arsenic emission reduction efficiency—the increased cost of testing the inlet and outlet of the control device. This type of testing using Test Method 108 would cost about $13,250 for a typical furnace as opposed to about $10,000 for particulate matter testing using Reference Method 5. The EPA believes, however, that the additional testing costs involved in determining the efficiency of a control device in reducing arsenic emissions are warranted, considering the various problems and impacts associated with the proposed emission limits for total particulates. Therefore, the format of the final standard is in terms of percent reduction of arsenic emissions.

Control Technology

Several commenters addressed the issue of the level of control of arsenic emissions achievable by conventional particulate control technologies. Many of these comments were concerned with the effect of temperature on the percentage of total arsenic emitted in particulate form, and, therefore, available for removal by the control devices.

As discussed in the preamble to the proposed regulation, theoretical considerations indicate that all of the arsenic emitted from glass melting furnaces would be in the vapor phase at typical furnace exhaust temperatures. At the time of proposal, however, data from EPA tests on two particulate control devices installed on glass melting furnaces that use liquid arsenic acid as a raw material showed that more than 90 percent of the emitted arsenic was in particulate form and collected by the control devices. On the basis of these data, EPA concluded that cooling of the exhaust gases may not be effective in increasing the efficiency of particulate control devices in reducing arsenic emissions from glass melting furnaces. The EPA acknowledged at the time, however, that emissions from furnaces using powdered arsenic trioxide rather than liquid arsenic acid might consist of substantially more vapor-phase arsenic. It was also uncertain whether the relationship between temperature and the proportion of arsenic emitted in the solid phase was the same for all types of glass.

In order to resolve these questions, the EPA performed five emission tests after proposal on arsenic-using glass melting furnaces. The tests proved helpful in demonstrating that the use of powdered arsenic trioxide instead of arsenic acid had little or no effect on the proportion of arsenic emitted in the solid phase. The results of these tests were inconclusive, however, as to the effect of temperature on the proportion of arsenic in the solid phase for different types of glass. The EPA presented a summary of the data in the **Federal Register** on March 20, 1984 (49 FR 10278), and tentatively concluded that a decrease in temperature would result in an increase in particulate arsenic for soda-lime furnaces, but not for other types of furnaces. These data are discussed fully in that notice and in the BID for the promulgated standard. In developing the requirements in the final standard, EPA considered public comments on the March 20, 1984, **Federal Register** notice and the results of two additional emission tests that are discussed below.

Control Methods for Soda-Lime Furnaces. The representative for Corning Glass Works stated that data from one of the commenter's soda-lime furnaces indicate that the percentage of arsenic in the particulate matter increases, rather than decreases, with increasing exhaust gas temperature. The proportion of arsenic found in the particulate from this furnace varied widely, however, from a low of about 50 percent to a high of 99 percent. Data provided by the commenter for a furnace producing aluminosilicate glass also showed a wide variability in the proportion of total arsenic that was emitted as particulate matter. For 23 representative samples collected on this furnace, from about 30 to 100 percent of the total arsenic was emitted as particulate. The commenter concluded that temperature is not the only factor affecting the fraction of total arsenic emitted as particulate matter. The commenter for Owens-Illinois challenged the validity of the data presented by EPA in the March 20, 1984, **Federal Register**. This commenter stated that the data were flawed and did not conclusively demonstrate that there is a relationship between temperature and the fraction of total arsenic emitted in particulate form. The commenter believes that EPA's earlier conclusion that at least 90 percent control of arsenic emissions can be achieved by particulate control devices is correct. The NRDC stated that the data presented by EPA demonstrate that emissions of particulate arsenic increase sharply as the temperature of the furnace exhaust gases decreases, and that EPA should require exhaust gases from soda-lime furnaces to be cooled to 121°C (250°F) prior to entering a particulate control device.

The results of the first test on a furnace melting soda-lime glass showed that less of the total arsenic emitted from the furnace was in particulate form compared to the previous tests (about 74 percent compared to more than 90 percent) at the standard EPA Method 108 sampling temperature of 121°C (250°F). In addition, samples taken simultaneously at three different temperatures (121°C, 204°C, and 288°C) showed that the amount of arsenic in the particulate matter generally increased as the filtered gas was cooled from 288°C (550°F) to 121°C (250°F). However, the amount of vapor-phase arsenic detected in these samples did not decrease in proportion to the increase observed in particulate arsenic, and the total amount of arsenic collected at 288°C (550°F) was uniformly less than the total amount collected at a filtered gas termperature of 121°C (250°F). The results of this test were also complicated by the fact that some of the filters used during the test were later found to be torn. Because there was not a decrease in vapor-phase arsenic emissions in proportion to the apparent increase in particulate arsenic, no clear basis exists for concluding that cooling of the exhaust gases causes a significant amount of vapor-phase arsenic to condense and form particulate arsenic. For this reason, the Agency has no assurance that cooling of furnace exhaust gases would result in a significantly higher arsenic removal efficiency. The Agency agrees with the commenter that the data obtained from the first test on a soda-lime furnace are inconclusive, and are insufficient to support a limit on the temperature of the gases at the inlet of particulate control devices.

After publication of the notice in the **Federal Register** on March 20, 1984, a second arsenic emission test was performed on a soda-lime glass melting furnace. No significant amounts of vapor-phase arsenic were found in the emissions from this furnace regardless of the temperature of the filtered gas. In all test runs, more than 99 percent of the total arsenic was captured as particulate matter. Therefore, even if the results of the first test on a soda-lime furnace had quantified a relationship between temperature and the amount of arsenic emitted as particulate matter, this relationship could not be generalized to all furnaces producing soda-lime glass.

The EPA also performed emission tests on a glass melting furnace producing an aluminosilicate glass. Although the furnace is not presently equipped with a permanent control device, a pilot-scale fabric filter system had been recently installed on the furnace. The test program included both EPA Method 108 and single-point sampling, as well as a series of performance tests on the pilot-scale fabric filter. The results of these tests did conclusively demonstrate that cooling of the furnace exhaust gases caused gaseous arsenic to condense, and thereby increased the effectiveness of the fabric filter in reducing arsenic emissions. When the temperature of the exhaust gas was cooled to below 121°C (250°F), control efficiencies ranged from about 75 percent to 97 percent and averaged about 87 percent. When the temperature of the exhaust gas was maintained above 121°C (250°F), control efficiencies ranged from about 58 percent to 82 percent and averaged about 71 percent. The data also indicated that the effectiveness of cooling is sensitive to the concentration of gaseous arsenic in the exhaust gas and to the residence time of the gas stream at lower temperatures. However, the data collected during these tests are not sufficient to correlate specific temperatures to specific removal efficiencies.

Although the available data to indicate that arsenic emissions from some glass melting furnaces may occur less predominantly as particulate matter than was previously believed, and that cooling can be effective in increasing the proportion of total arsenic emitted as particulate matter, no correlations have been identified between the proportion of arsenic emitted as particulate matter and the type of glass produced, the type of melting furnace used, the type of arsenic added to the raw materials, or any other source characteristics. In addition, EPA does not have sufficient data to conclude that cooling of furnace exhaust gases would be effective in incrasing the efficiency of a control device in all cases. Therefore, a requirement that the exhaust gas from all affected furnaces be cooled to some specific level prior to entering a control device would result in increased costs with no guarantee that additional control would be achieved. The Agency does believe, nonetheless, that both the format and the level of the final standard are sufficient to ensure that furnace exhaust gases are cooled in those instances where the effectiveness of control is dependent on the operating temperature of the control device.

Elimination of Arsenic in Glass Manufacturing

Four commenters representing Owens-Illinois, the Glass Packaging Institute, NRDC, and legal counsel for Container Glass Manufacturers, discussed the elimination of arsenic as a raw material in the manufacture of glass. Two of these commenters stated that use of arsenic in the manufacture of glass containers has been completely eliminated, and that there is no technical reason to use arsenic in the manufacture of glass container products. These two commenters made no objection to a requirement that arsenic be eliminated from glass container manufacturing, as long as no additional administrative burdens were placed upon container glass manufacturers. The commenter for Owens-Illinois stated that the use of arsenic in the manufacture of pressed and blown glassware is essential and that no acceptable substitutes are currently available. Without arsenic, tableware glass tends to have an objectionable green tint. The NRDC objected to the contention that the elimination of arsenic in pressed and blown glass manufacturing would have serious consequences for this sector of the glass manufacturing industry. The commenter stated that the only benefit to the glass industry stemming from the use of arsenic is that it improves the cosmetic qualities of the glass by making it clearer. The NRDC asserted that cosmetic benefits are insufficient to justify public exposure to arsenic emissions and urged that the standard be amended to eliminate arsenic from the manufacture of pressed and blown glass. The commenter also stated that if there are specialized, nonsubstitutable uses for arsenic that rise above the level of cosmetics, then EPA should set a standard requiring extremely stringent controls for a small number of furnaces dedicated to such uses.

Based on the public comments received and the information available before and after proposal of the standard, the EPA has concluded that the container glass, flat glass, and wool fiberglass segments of the glass manufacturing industry do not use arsenic as a raw material in the manufacturing process. Because the promulgated standard applies only to furnaces that use arsenic as a raw material, no furnaces in the container, flat, or wool fiberglass segments of the glass industry would be affected. Owners or operators of furnaces that do not melt a glass in which arsenic is added as a raw material are not subject to the requirements of this standard, including those for reporting and recordkeeping. If an owner or operator of a furnace in any of these segments of the industry were to begin using arsenic, the furnace would be subject to the standard.

Arsenic is used in the manufacture of some products in the pressed and blown segment of the glass industry, however. A case-by-case assessment of the potential to eliminate arsenic use was conducted by contacting all six major manufacturers of pressed and blown soda-lime glassware (A-83-08/IV-B-13). Although some companies have been successful in removing arsenic entirely from their raw batch materials, other companies producing similar types of glass have been unable to obtain a product of acceptable quality when arsenic is removed. Although the qualities achieved by the inclusion of arsenic (clarity, elimination of unwanted color, etc.) are "cosmetic," they do have economic value, and reflect certain physical attributes of the final product that are required by the consumer. Demand for these products is inherently connected to their physical appearance which, therefore, has a tangible economic value. The EPA expects that producers of pressed and blown glassware will continue to try to eliminate arsenic from their batch recipes to avoid being subject to the requirements of this standard. It is not clear, however, when (and if) these efforts will be successful. Because a requirement to eliminate the use of arsenic in the pressed and blown glass segment of the industry could cause severe economic impacts for some producers, it is not included in the final standard but will be evaluated as part of the 5-year review of the standard.

Costs and Economic Impact

The Corning Glass Works representative stated the belief that some plants would close down if the proposed standard were promulgated, but did not provide any data to support that statement. Another commenter representing Owens-Illinois stated that the monetary costs required to comply with the standard would severly affect an already depressed market, which is facing significant and increasing competition from foreign producers of glass tableware. Between 1979 and 1982, the compound growth in imports has been 6.8 percent, while growth in the domestic share of the market has declined by 0.4 percent. In addition, over the past 10 years there has been a decline in real total dollar market value for the U.S. tableware industry. Two tableware manufacturers have recently closed plants. The strong U.S. dollar will continue to favor imports of glass tableware. The commenter stated that reducing emissions to the level proposed by the standard is estimated to cost $15.65/Mg ($14.20/ton) of glass. These costs would increase operating costs by over $2 million per year. This represents an increase of 2.1 percent in production costs over 1982 levels, which would have decreased 1982 profits by 25 percent.

The EPA recognizes that machine-made glass tableware manufacturers are facing competition from foreign producers of glass tableware; and in the economic analysis conducted after proposal, it was assumed that prices cannot be raised and that companies must absorb the control costs as decreased profits. (See Appendix B of the BID for promulgated standard.) The costs cited by the commenter were for a specific plant owned and operated by the commenter. The costs and economic impacts of the promulgated standard were analyzed for this plant, and EPA concluded that they would be disproportionately high compared to the risk reduction that would be achieved through compliance with the standard. Therefore, while the plant is one of several that would have had to install control devices to achieve the proposed standard, it is expected to have average annual arsenic emissions below the revised emission limit for existing furnaces in the final standard.

The economic analysis indicated a potential closure for only one furnace currently using arsenic and with arsenic emissions above the revised cutoff. Company representatives have informed EPA, however, that they plan to eliminate the use of arsenic at this furnace; therefore, it would not be affected by the standard. The EPA's analysis indicated that no other furnace closures would result from the standard.

One commenter for NRDC stated that the "worst case" economic analysis conducted by EPA has been grossly exaggerated in reaching a conclusion that under certain conditions the proposed regulation could cause some furnaces to close. Further, the commenter stated that the assertion that the elimination of arsenic from pressed and blown glass would make U.S. manufactured glassware uncompetitive with glassware imported from countries that do not restrict arsenic use has not been supported by hard data or analysis. The commenter stated that if the regulation does impose a competitive disadvantage on U.S. glass manufacturers, other steps should be taken to protect their position, such as the imposition of duties on imports of arsenic-containing glass.

The revised economic analysis of the promulgated standard explains that cost absorption (profit reduction) by producers, rather than cost pass-through to consumers, is more likely to result because of the competitive role of imports. Using this assumption, all control costs were analyzed as additions to baseline operating expenses. No closures are anticipated as a result of the promulgated standard.

The EPA's assertion that U.S. manufacturers of pressed and blown glass would be at a competitive disadvantage to foreign manufacturers if arsenic were eliminated as a glass additive is based on the fact that the properties that arsenic provides for glass products have an economic value. Such properties as clarity are desired by the consumer and, thus, are considered necessary for certain products to be competitive in the market. The economic value of these properties has not been quantified but is, nevertheless, real. The commenter's suggestion that duties be imposed on imports of pressed and blown glass that contain arsenic cannot be implemented because EPA does not have legislative authority to impose such duties or to take any similar measure to reduce possible competition to U.S. glassware manufacturers by foreign glass.

Monitoring and Measurement Methods

One commenter for the Toledo, Ohio, Environmental Services Agency supported EPA's position that a material balance or other non-stack test data be used to establish whether a facility is affected by the proposed regulation and to monitor compliance. However, the commenter requested clarification on two points. First, how much confidence does the EPA have in the estimates of arsenic retention in glass? Specifically, should the low end of the estimate, 70 percent retention, be used in estimating uncontrolled arsenic emissions? Second, how should the arsenic content of the cullet be determined? Is it accurate to assume that all of the arsenic entering with the cullet remains in the glass, and thus has no impact on arsenic emissions?

The estimates of the amount of arsenic in the glass product were provided by the glass industry. Data obtained from tests conducted by EPA have been found to be reasonably consistent with data supplied by industry representatives. It should be noted, however, that the amount of arsenic retained in the glass can vary significantly according to the specific recipe used in making glass.

The 70 percent retention value published in the proposal BID (EPA-450/3-83-011a) was supplied by industry representatives as a typical retention rate for lead silicate type glass. Data gathered by the EPA after proposal have demonstrated that at least 70 percent of the arsenic is retained in the glass product, regardless of its composition. However, the amount of arsenic retained in the glass product is not strictly a function of the type of glass produced. For any given type of glass, the percentage of arsenic retained in the product can vary widely. For example, data collected by EPA show that the percent of arsenic retained in soda-lime glass can range from about 70 percent to about 90 percent. Therefore, in estimating uncontrolled arsenic emissions the arsenic retention value should be based on actual laboratory analysis of the glass produced in a specific melting furnace. If analytical data are not available, an assumed retention value of 70 percent would provide an estimate of the maximum rate of uncontrolled arsenic emissions from the glass melting furnace. In developing a material balance for monitoring compliance, it is the responsibility of the furnace owner or operator to provide a theoretical emission factor that accurately takes into account the amount of arsenic retained in the glass. Retention values should be based on actual analytical data for the specific type(s) of glass produced by the affected furnace.

The amount of arsenic entering the furnace in the cullet should be explicitly accounted for. Some furnaces may add mixed cullet that is not exactly similar in chemical composition to the type of glass being melted. When the cullet added is identical to the glass being produced, the percentage of arsenic in the cullet can be assumed to be identical to the percentage retained in the glass. Thus, the arsenic entering with the cullet would not have any impact on inorganic arsenic emissions. When this assumption is made, however, care must be taken to calculate the amount of arsenic retained in the glass on the basis of the percent of product weight that is derived from fresh raw materials rather than on the basis of the total product weight. This is discussed in more detail in the BID for the promulgated standard.

Opacity Monitoring

Two commenters (Owens-Illinois and Corning Glass Works) stated that the proposed requirement for opacity monitoring of emissions exiting the control device in unnecessary and inconsistent with the NSPS for glass manufacturing, which does not require opacity monitoring. The commenter for Owens-Illinois indicated that opacity monitoring would represent an unjustifiable cost burden. The commenter for Corning stated that opacity monitoring is administratively burdensome, and readings cannot be correlated with emissions of either inorganic arsenic or particulate, especially when multiple furnaces are exhausted to a common stack. The commenter noted that excessive stack opacity occurs in one of the commenter's furnaces as a result of gaseous fluoride emissions from melting one type of glass, and that this opacity is unrelated to inorganic arsenic or total particulate emissions.

The requirement for opacity monitoring was proposed as a means to ensure that emission control devices installed on arsenic-using glass furnaces are continuously operated and maintained in a manner consistent with the procedures followed to comply with the standard initially. These requirements have been retained in the promulgated standard. Under the glass manufacturing NSPS promulgated October 19, 1984, opacity monitoring is not required for glass furnaces equipped with control devices. However, opacity monitoring is required for furnaces using process modifications to meet the NSPS. The NSPS requirement for glass manufacturing plants has no bearing on this action because the intent of this regulation is to control a hazardous air pollutant that is not specifically regulated under the NSPS. With respect to the costs of opacity monitoring, EPA has determined that the costs involved are reasonable in light of the additional information provided to the owner and operator of a control system and the improved effectiveness in enforcement that will be gained as a result of this requirement. No information has been presented to the Agency that indicates that continuous monitoring of opacity represents an unjustifiable cost burden.

The promulgated standard does not set any specific limit on stack gas opacity based on correlations between opacity and emissions of either particulate matter or of arsenic. Rather, the promulgated standard requires that a 6-minute average reference opacity value for a given furnace be determined during compliance testing. Any subsequent exceedance of the reference opacity value established during a compliance test must be reported semiannually. If excess opacity occurs as a result of a change in the composition of the glass being melted in a furnace, this cause should be cited in the report. Alternatively, if multiple types of glass are typically melted in a single furnace, and stack gas opacity is expected to be significantly higher for one type of glass, the initial compliance test may be performed while this glass is being melted. Finally, paragraph 61.163(h) of the promulgated standard allows owners or operators of affected furnaces to petition the Administrator for approval of any alternative continuous monitoring system that can be demonstrated to provide accurate and representative monitoring of a properly operating control device.

Several commenters suggested changes in the proposed Method 108. These suggestions and the rationale for changes are discussed in the BID for the promulgated standard. Briefly, changes in Method 108 include deletion of all references to SO_2 collection and analysis, a change in the sampling temperature for glass furnaces to 121°C±14°C (250°F±25°F), a revision requiring that audit samples be analyzed at least once per month, and elimination of the digestion procedure when Method 108 is applied to glass furnaces.

One commenter for the Department of Environmental Resources in Harrisburg, Pennsylvania, saw no reason to differentiate between sources firing fuels with more than, or less than, 0.5 percent by weight sulfur content. The Agency agrees that there is no reason to differentiate between sources firing fuel with greater than 0.5 percent by weight sulfur from those with less than 0.5 percent, and has revised the standard accordingly.

The commenter for Corning Glass Works stated that the time allowances for testing under the proposed § 61.163 were inflexible and inadequate, and that the specified testing procedures were inflexible and unnecessary. In support, the commenter provided data showing that other analytical methods can provide similar results to those obtained when using the specified EPA Method 108 procedures.

The major difference between the procedure proposed by the commenter and the EPA Method 108 procedure was in the method used in determining arsenic concentration of the samples. The procedure proposed by the commenter employed the colorimetric molybdenum blue method instead of atomic absorption. There were also slight differences in the types of reagents employed, and the procedures followed in leaching the materials collected by the probe, filter, and impingers. In the example provided, the amount of arsenic detected when using the molybdenum blue method was 21 mg, 5 mg, and 0.2 mg in the filter, probe, and impingers, respectively. These results compared to detected arsenic levels when using EPA Method 108 procedures of 21 mg in the filter, 1 mg in the probe, and 0.4 mg in the impingers.

Under 40 CFR 61.14 in Subpart A—General Provisions, the Administrator may allow the use of any alternative method that he has determined to be adequate for indicating whether a source is in compliance. Anyone wishing to have a method approved as an alternative may submit comparative date between the candidate method and the reference method for evaluation by the Administrator.

Reporting Requirements

The commenter for Owens-Illinois stated that it is unreasonable and irrational to require 12-month projections of arsenic emissions from glass plants and that semiannual reporting of past emissions should be sufficient for enforcement purposes.

The requirement that inorganic arsenic emissions be projected over a 12-month period is necessary in order for the operator of the glass manufacturing furnace to anticipate the level of control that will be required for each facility. Only in this way can possible instances of noncompliance with the standard be prevented. The calculation of past emissions may reveal actual instances of noncompliance, but only after unacceptable levels of inorganic arsenic have been emitted into the atmosphere. This result would be inconsistent with the objectives of section 112 of the Act.

The commenter for Corning Glass Works stated that many administrative problems could result with EPA's semiannual reporting requirements under the proposed § 61.163. The administrative problems referred to in this comment have not been specified. However, it is EPA's conclusion that the reporting, recordkeeping, and other requirements contained in the standard are both necessary to the implementation of the regulation and reasonable in their impact on the glass manufacturing industry and individual furnace owners and operators.

Impacts of Reporting and Recordkeeping Requirements

The EPA believes that the required reporting and recordkeeping requirements are necessary to assist the Agency in (1) identifying sources; (2) determining initial compliance; and (3) enforcing the standard.

The Paperwork Reduction Act (PRA) of 1980 (Pub. L. 96-511) requires that the Office of Management and Budget (OMB) approve reporting and recordkeeping requirements that qualify as an "information collection request" (ICR). To accommodate OMB review, EPA uses 3-year periods in its impact analysis procedures for estimating the labor-hour burden of reporting and recordkeeping requirements.

The average annual burden on owners and operators of glass maunfacturing plants to comply with the reporting and recordkeeping requirements of the standard over the first 3 years after the effective date is estimated to be about 23,100 labor-hours.

V. Arsenic Trioxide and Metallic Arsenic Production Facilities

As discussed in the overview section of this preamble, on July 20, 1983, EPA proposed a standard in the **Federal Register** for primary copper smelters procesing feed materials with 0.7 percent or greater arsenic. This proposed standard would have affected only the ASARCO smelter in Tacoma, Washington. The EPA proposed for comment additional controls for fugitive emission sources in the copper smelter and the arsenic plants at the ASARCO-Tacoma facility in a **Federal Register** notice on December 16, 1983 (48 FR 55880). On June 27, 1984, ASARCO announced plans to close its primary copper smelting operations at Tacoma, Washington by June 30, 1985; and subsequently ceased copper smelting operations at Tacoma. In the June 1984 announcements, ASARCO also stated that it will continue to operate the arsenic trioxide and metallic arsenic plants at the site and that the plants will be operated in an environmentally acceptable manner. From discussions with ASARCO personnel, EPA has concluded that there is some uncertainty regarding the process to be used and the future configuration of the arsenic trioxide plant. According to public statements, ASARCO is considering several different modifications to its arsenic trioxide production process including the use of a wet leaching process or enclosure of the Godfrey roasters and control of emissions using a fabric filter collector. ASARCO expects that these modifications will significantly reduce arsenic emissions from the facility, but has not yet completed detailed plans or a schedule for this change. Consequently, the Administrator decided that the proposed fugitive emission standard for arsenic plants should be promulgated. This part of the preamble presents the standard for arsenic trioxide and metallic arsenic production facilities, its basis, and a discussion of the comments on the proposed standard.

Summary of Promulgated Standard

Applicability

The standard that is being promulgated today applies to each new and existing arsenic trioxide production facility processing low-grade arsenic bearing materials by a pyrometallurgical (roasting and condensation) process and to each new and existing metallic arsenic facility. Facilities that produce arsenic trioxide solely by wet leaching or extraction processes are not subject to this standard.

Standard

The standard requires the identification of potential arsenic emission sources and preparation and implementation of a detailed inspection, maintenance, and housekeeping plan that will be used to minimize emissions from the arsenic trioxide and metallic arsentic production facilities. The standard requires the plan to fulfill the stated objectives of: (1) Cleanup of arsenic containing materials; (2) regular maintenance and inspection of process, conveying, and air pollution control equipment; and (3) reduction of emissions during malfunctions to the maximum extent feasible.

Requirements for Periods of Excess Emissions

During periods of startup and shutdown, the standard requires that emissions of inorganic arsenic be minimized to the greatest extent possible. The standard also requires the following measures to minimize emissions from malfunctions and upsets: (1) All steps necessary to limit emissions, including curtailing operations until the equipment is repaired or the process is operating normally; (2) establishment of a plan that describes specific actions to be taken during malfunctions and upsets:

and (3) a routine maintenance program for process, conveying, and emission control equipment.

Compliance Provisions

The standard requires compliance within 90 days of today's date, unless a waiver of compliance is obtained from the Administrator. If a waiver of compliance is granted, the plan shall be submitted on a date set by the Administrator. Waivers can be granted for a period of time needed to install controls to comply with the standard, not to exceed 2 years from today's date.

Continuous Monitoring

Continuous opacity monitoring is required for process emissions that exist from a control device. The standard requires that a reference opacity level be established for each emission stream based on the highest 6-minute average opacity level monitored during a 36-hour evaluation period. Thereafter, occurrences of opacity readings above the respective reference level must be reported as exceedances to the Administrator along with information describing the cause of the exeedances.

Recordkeeping and Reporting Requirements

Owners or operators of sources covered by the standard will be subject to the reporting and recordkeeping requirements of the standard as well as those prescribed in the General Provisions (Subpart A) of 40 CFR Part 61. Reporting and recordkeeping requirements of the General Provisions were discussed in the preamble to the proposed standards (48 FR 33112). Specific reporting requirements of the promulgated standard include: (2) Quarterly reports of occurrences of excess opacity readings and ambient arsenic concentrations; and (1) semiannual status reports on pilot plant studies on alternative arsenic trioxide production processes. Owners and operators are also required to submit the following reports for the opacity monitoring system: (1) Evaluation to verify the operational status of the opacity monitors; and (2) report of reference opacity level and supporting data.

Records of supporting data for the reports described above must be maintained at the source for a period of 2 years and made available to the Administrator upon request. These records will include the logs demonstrating compliance with the general work practices and records of all opacity measurements and repairs to the monitoring device.

Summary of Enviromental, Health, Energy, and Economic Impacts

The standard being established today affects new and existing arsenic trioxide and metallic arsenic production facilities. It is expected that the standard will affect one facility, the arsenic plant at ASARCO-Tacoma.

The standard is expected to reduce emissions from malfunctions and upsets in the arsenic plant and to reduce reentrainment of arsenic-containing materials from plant surfaces. However, the impact of the standard on fugitive emissions from the arsenic plant cannot be quantified because of the difficulties inherent in estimating fugitive emissions, the unpredictability of malfunctions, and the considerable uncertainties regarding the processes and operations that will be used at the facility in the future. The standard is based on application of control measures that are necessary and are applicable at this time, and is not based on application of a quantitative risk management approach.

Application of the required housekeeping and maintenance provisions should have no effect on the solid waste, water, or energy impacts of the facility. Annualized costs required to comply with the standard are estimated to be about $265,000. The primary economic impacts associated with the standard are projected small decreases in profitability for the ASARCO-Tacoma arsenic plant, if costs cannot be passed through. If costs are passed forward in the form of a price increase, it is estimated that the standard will result in less than a 5 percent increase in the price of arsenic trioxide. This standard is not expected to cause closure of the affected plant.

Significant Changes Since Proposal

A number of major changes have been made to the requirements proposed on July 20, 1983, and December 16, 1983. These changes are: (1) Deletion of specific equipment requirements for the arsenic plant. The proposed requirements for modifications to equipment in the arsenic plant have been removed from the standard. These modifications are not being required because either the equipment is in place and likely to remain in place or there is a more cost-effective means of achieving the emission reduction; (2) Modification of the proposed work practices. While the proposed requirement for preparation of an inspection, maintenance, and housekeeping plan has been retained, specific aspects have been modified. The final requirements for an approvable plan do not require the inspector to follow a prescribed route. In addition, the proposed requirement to shut down malfunctioning equipment until it is repaired has been modified to require the source to describe the time and actions required to curtail increased emissions due to malfunctions; and (3) Clarification of the recordkeeping and reporting requirements provisions and inclusion of minor new provisions. The standard requires quarterly reporting of excess opacity readings and of ambient arsenic concentration monitoring data and semiannual status reports on pilot plant studies on alternative arsenic trioxide production processes. The basis for the changes is described in the Discussion of Comments section of this part of the preamble.

Additional Analyses

Since proposal of the standards on July 20, 1983 (48 FR 33112), EPA has developed estimates of process and fugitive emissions from the arsenic plant and has identified additional control measures to reduce arsenic emissions from the facility. These revised emission estimates are based on an on-site emission inventory and emission testing.

Emission estimates for the arsenic plant fabric filter collector are based on the results of EPA emission tests conducted in September 1983. Operation of the arsenic trioxide plant and the metallic arsenic plant were closely monitored during the tests to ensure that testing was conducted during normal operations. These test results showed average outlet arsenic concentrations and mass emission rates of 3.17 mg/dscm (0.0014 gr/dscf) and 0.15 kg/h (0.33 lb/h), respectively. These results represent an average collection efficiency for the fabric filter collector greater than 99 percent.

Potential sources of low-level fugitive emissions in the arsenic plant were assessed during extensive on-site inspections during June 1983, and emission estimates were developed. Based on these assessments, it is estimated that approximately 15 Mg/yr (17 tons/yr) of fugitive arsenic emissions were released from operations of the arsenic trioxide plant at ASARCO-Tacoma in 1982. These estimates are based on visual observations of the sources and operations and on engineering judgment since fugitive emissions from these sources cannot be measured readily. Consequently, these estimates are subject to significant imprecision.

The EPA conducted further investigations to identify controls that could reduce fugitive arsenic emissions from the arsenic plant as well as from other sources at the ASARCO-Tacoma smelter. The on-site inspection revealed that specific equipment modifications and housekeeping practices would reduce arsenic emissions. The list of potential control measures for fugitive arsenic sources was published in the December 16, 1983, **Federal Register** notice (48 FR 55880). The EPA reviewed the condidate control requirements considering public comments on the requirements. The final requirements are based on this review and on consideration of whether the controls are already installed or required by another regulation or agreement, and are likely to remain in operation or good repair. The final requirements are summarized in the Summary of Promulgated Standard section and are discussed in the Basis for Standard and Discussion of Comments—Control Technology sections of this preamble. Cost estimates were also developed for the fugitive arsenic emission controls.

Basis for Standard

A standard is being established for the arsenic trioxide and metallic arsenic production facilities at ASARCO-Tacoma because with current production processes and operations the arsenic plant is a significant contributor to ambient exposures to inorganic arsenic. Fugitive emissions from the arsenic plant are estimated currently to be about 6 Mg per year (7 tons per year), due to recent implementation of controls required by the Tripartite Agreement (i.e., the agreement among ASARCO, the union, and the State of Washington Department of Labor and Industries).

The standard that is being established today is based on available fugitive emissions control measures that can be readily applied. Section 112(e)(1) of the Act authorizes design, equipment, work practice, or operational standards when (a) the pollutant cannot be emitted through a conveyance designed and constructed to emit or capture the pollutant; or (b) the application of a measurement methodology is not practicable due to technological or economic limitations. The fugitive emissions that are being controlled through the arsenic plant standard would result from poor housekeeping practices and poor maintenance of process and emission control equipment. They cannot be emitted through a conveyance designed and constructed to emit or capture them, and their frequency and magnitude would vary to such an extent that measurement would not be practicable. Therefore, the format of the standard is one in which work practices and preventative maintenance control measures are required rather than a numerical emission limit. These control measures reflect application of general housekeeping procedures to the facility, and represent a level of control that can be required at this time in the absence of certainty on the future production process. Control measures beyond this minimum level of control are not being required because EPA is not in a position to identify the processes and applicable controls at this time. The standard was based on consideration of the need to minimize arsenic emissions through use of additional control measures, as well as on the feasibility and cost of these measures. The control measures considered include improved housekeeping practices and curtailment of emissions during malfunctions.

Equipment and Work Practices for Fugitive Emission Control

During the evaluation of additional controls, EPA conducted onsite inspections of processes and operations at the ASARCO-Tacoma facility. The on-site investigation identified several low-level arsenic emission sources where additional emission control is possible. Specifically, it was noted that overall housekeeping in the arsenic trioxide process area was poor with light to heavy accumulations of dust on all surfaces. Since this dust can be re-entrained and release emissions to the atmosphere, it was concluded that emission controls and improved housekeeping practices are needed. The contribution of these sources to total emissions from the facility cannot be accurately estimated. However, high ambient arsenic concentrations measured at the close-in ambient air monitors have been attributed by ASARCO, in part, to re-entrainment of dust from buildings and plant surfaces. Furthermore, in the public hearings on the proposed standards, testimony by representatives of ASARCO indicated that no formal operations and emissions logging procedure is used by ASARCO to assess the causes of high ambient arsenic concentrations.

Potential equipment, work practice, and recordkeeping requirements for sources of fugitive emissions were described in the December 16, 1983, **Federal Register** notice (48 FR 55880). Comments were received on the need for these additional controls and on their technical feasibility and costs. The comments were reviewed, and the equipment and work practice requirements which are feasible and likely to result in significant additional emission reduction were identified. This assessment of the control measures is presented in the Discussion of Comments section of this part of the preamble. From the consideration of public comments, it was concluded that none of the proposed equipment requirements should be imposed and that the proposed work practices should be slightly modified. Also identified were recordkeeping requirements that will be useful in determining probable causes of high ambient arsenic concentrations and steps that must be taken to prevent their reoccurrence. Combined, the identified control options for low-level fugitive emission sources are expected to reduce emissions from fugitive sources (and to maintain them) below current levels. The estimated combined annualized cost for inspection and maintenance requirements is about $265,000. In the Administrator's judgment, this cost is reasonable and affordable. Therefore, these requirements are included in the final standard.

Curtailment During Malfunctions

At the ASARCO-Tacoma smelter, ambient monitoring data for monitors at or near the plant boundaries have shown that arsenic concentrations dramatically increased when malfunctions and upsets occurred with the converters, the reverberatory furnace, the arsenic plant, or the liquid sulfur dioxide (SO_2) plant. Furthermore, on occasion these malfunctions have persisted for several days. The need for prompt attention to malfunctions was also demonstrated during EPA's emission test program conducted in September 1983. During emission testing of the arsenic plant baghouse, EPA personnel observed that the air slide conveying system, which transfers arsenic-laden dust back to the process, was blowing dust into the air. A large quantity of arsenic-laden dust (white dust) had accumulated under and around the air slide. No ASARCO personnel were in the immediate area, and based on EPA's understanding of the operations, none would have been in the area until the next day. (ASARCO personnel were located and the process was taken out of service until the air slide was repaired.)

The Administrator recognizes that malfunctions cannot be completely prevented. However, there are measures that can be taken to reduce emission rates significantly and to minimize the time during which increased emissions occur due to malfunctions. The most effective of these emission reduction measures is to shut down the affected operations when malfunctions occur. Therefore, in the December 16, 1983,

Federal Register notice (48 FR 55880) EPA proposed that a housekeeping plan be submitted that would include provisions for : (1) Regular inspection of all process, conveying, and emission control equipment; and (2) repair of malfunctioning or damaged equipment as soon as possible and shutdown of any operation involving material having an arsenic content greater than 2 percent until the equipment is repaired. Because the inclusion of a comprehensive list of all potential malfunctions in a regulation is impractical, the Administrator concluded that it would be more effective if the owner or operator of the source were to identify potential emission sources and the steps to be taken to minimize emissions (including shutdown) when they occur. Therefore, the final standard requires the owner or operator to submit a plan for EPA approval that outlines the steps that can and will be taken to curtail operations when equipment malfunctions or process upsets occur. The plan will include all operations, processes, and control equipment that handle material having an arsenic content greater than 2 percent. The program will describe the specific steps that will be taken to take out of operation or idle the affected operations, and the minimum time in which this can be accomplished. For the purpose of this standard, a malfunction is defined as any sudden failure of process or air pollution control equipment or of a process to operate normally which results in increased emissions of arsenic. Shutdown means the cessation of operation of the equipment or the addition of materials to process equipment.

The EPA would consider a failure of equipment or a process upset caused entirely or in part by poor maintenance, careless operation, or other preventable upset condition or equipment breakdown, to be the result of improper operation and maintenance. Improper operation and maintenance is a violation of the standard. The provisions pertaining to malfunctions which are discussed above do not excuse such violations.

Discussion of Comments

This section presents a summary of the specific comments pertaining to the arsenic plant at the ASARCO-Tacoma smelter. The comments were made in letters and in hearing testimony on the proposed standard for ASARCO-Tacoma's copper smelting operations. The comments are discussed by major topic area below.

Emission Estimates

Throughout the public comment period, comments were received concerning EPA's estimates of inorganic arsenic emissions from the ASARCO-Tacoma copper smelter and arsenic plant. Initially, the comments concerned the emission estimates presented in the July 20, 1983, **Federal Register** notice of proposed rulemaking and the BID for the proposed standard (EPA-450/3-83-009a). Several commenters, including ASARCO and PSAPCA, claimed that the emission rates presented by EPA significantly overstated the amount of arsenic being emitted. During the public comment period, EPA published several revised estimates of arsenic emission rates in 1982. Additional comments were received regarding these revised emission estimates. These commenters primarily focused on the emission estimates for the smelter's converter fugitive emissions and other low-level sources. The commenters still thought that EPA's emission estimates overstated the amount of arsenic being emitted from the ASARCO-Tacoma copper smelter and arsenic plant.

Since proposal, EPA has conducted emission tests of the arsenic plant fabric filter collector. New information on sources of low-level arsenic emissions was also obtained by EPA during extensive on-site visits to the ASARCO-Tacoma smelter. The EPA also reviewed the comments and evaluated the supporting information provided by the commenters. Based on the emission test results, observations, and the improved understanding of plant operations, EPA revised its emission estimates. These revised emission estimates were submitted for review to representatives of national and local environmental groups, PSAPCA, the USWA, and ASARCO who had attended a December 20, 1983, working level meeting. The emission estimates were further revised and EPA now estimates that arsenic emissions from the arsenic plant in 1982 were about 15 Mg (17 tons) and current emissions are about 6 Mg (7 tons) per year. The emission rate of fugitive sources in the arsenic plant will be less than 6 Mg (7 tons) per year when all control measures required by the standard are in place. The actual emission reduction cannot be estimated inasmuch as the required control measures are for unpredictable events of varying emission potential. The basis of the final emission estimates is presented in the BID for the promulgated standard (EPA-450/3-83-010b).

The EPA recognizes that the emission estimates retain some uncertainty, and some commenters may think the estimates continue to overstate arsenic emissions from the arsenic plant. The EPA believes that, although uncertainties persist, these estimates represent a good approximation of the actual emission rates. These emissions can be significantly reduced through improved housekeeping practices.

Control Technology

Low-level fugitive sources. Several commenters, including PSAPCA and Washington State Department of Ecology (DOE), recommended that EPA establish standards which require control of low-level fugitive arsenic emission sources. The Administrator agrees with the commenters and has established work practice requirements to reduce fugitive emissions. These final requirements were selected from those published in the December 16, 1983, **Federal Register** notice, considering public comments on their need, feasibility, and costs. The requirements are expressed as work practice and operational standards because emissions from these sources cannot be measured accurately.

General and specific comments on the proposed equipment, work practice, and operational requirements were received from ASARCO and the USWA, and are discussed in the following paragraphs. ASARCO commented that the listed control measures were developed without considering the likelihood of the material being emitted into the ambient air, their technical feasibility, cost, or the cost effectiveness of the measures in reducing any health risk. The proposed additional control measures were based on EPA's assessment of controls that could be used to reduce fugitive emissions from the arsenic plant and smelter. The likelihood of fugitive emissions being released to the atmosphere was considered by the EPA in developing the requirements. The generally open configuration of buildings and EPA observations show that emissions released inside buildings at the ASARCO-Tacoma facility are likely to be released to the atmosphere. In some cases, such emissions disperse directly to the air outside buildings. In other cases, the emissions may settle on supporting structures and surfaces within the buildings. These deposits of dust on buildings and plant surfaces can be re-entrained during periods with high winds. In fact, ASARCO has attributed some episodes of high ambient arsenic concentrations to re-entrainment of dust from plant and building surfaces. Similarly, EPA believes that spills of materials can also serve as a source of fugitive emissions through re-entrainment of dust from building and plant surfaces. Thus, the additional control measures addressed all known sources or potential sources of fugitive emissions.

In developing the additional control measures, EPA also developed estimates of the costs. These control measures were briefly discussed in the meeting held December 20, 1983, and were placed in Docket Number A-80-40 for public inspection. (In response to comments, these estimates were revised and the revised estimates were also distributed to the meeting attendees for comment and to the public docket). The final control requirements are estimated to cost about $265,000 per year (increase in costs due to controls). These control measures were selected based on consideration of the need for the measure, the technical feasibility, and the estimated costs. The bases for the specific requirements are summarized below along with ASARCO's and the USWA's comments.

1. Equipment Standards—"Arsenic plant, raw dust conveyor system"—ASARCO's comments on the proposed requirement for a dust-tight conveying system for the arsenic plant were: (1) It is not possible to use an enclosed pneumatic conveying system to transfer wet dust (the dust is wetted because the Godfrey roasters cannot accept dry dust); and (2) the present covered belt conveyor system is best available technology. The USWA also commented that pneumatic conveying would require relocation of the zig-zag blender and recommended as an alternative that ASARCO be required to maintain the fullest possible enclosure of the zig-zag blender and belt transfer system and to ensure that leaks are promptly identified and repaired. The EPA considered these comments and believes that a pneumatic conveyor could be used as proposed by relocating the zig-zag blender closer to the Godfrey roasters. The EPA, however, also concluded that there were other more cost-effective ways of reducing emissions from transfer of raw dust from the arsenic plant storage bunkers to the Godfrey roasters. Specifically, the objective could be accomplished through improved housekeeping and maintenance of the existing system. Since EPA is establishing provisions that require a routine maintenance and repair program, the standard does not require installation of a dust-tight conveyor system in the arsenic plant.

"Godfrey roasters"—In response to the proposal to require installation and maintenance of a solid refractory arch on each Godfrey roaster, both ASARCO and USWA commented that all the arches have been installed. The final standard does not include this provision because the controls are in place and it is EPA's judgment that the controls are likely to remain in place.

"Calcine conveyor system"—In response to the proposal to require a pneumatic conveyor system for transfer of calcine from the Godfrey roaster water-cooled screw conceyors to the railcar loading station, ASARCO and USWA commented that this system has been installed and is operating. Thus, it is EPA's judgment that there is no need to require this system since it is in place and likely to remain in operation.

"Arsenic kitchen pulling area"—ASARCO commented that the enclosure around the kitchen pulling area that EPA proposed to require would be extremely large and expensive and is not justifiable. The USWA's industrial hygienist commented that the enclosure might exacerbate worker exposure to arsenic without any clear benefit to community air quality. The final standard does not require enclosure of the kitchen pulling areas because of the potential for significantly increased worker exposure in this area. This conclusion is based on a review of the conceptual design and calculations of expected arsenic concentrations within the enclosures where the kitchen pullers must work. Although workers in this area use full face respirators, this protection is not sufficient to fully isolate workers from exposure to arsenic because of the difficulties associated with the use of respirators. While it is theoretically possible to prevent increased exposure using respirators, it is more probable that employee exposures would significantly increase. Furthermore, EPA believes that substantial emission reductions can be achieved by improved housekeeping and maintenance of the arsenic plant without increasing worker exposures. Consequently, the regulation requires emissions from arsenic kitchen pulling to be minimized by cleaning up, wetting, or stabilizing dry, dusty, arsenic-bearing materials in the area.

2. Work Practices—Five general work practice objectives were listed in the December 16, 1983, **Federal Register** notice. Only ASARCO and the USWA commented on these proposed objectives for an inspection, maintenance, and housekeeping plan. The comments on each objective, and the objective, are discussed below.

"No accumulation of material having an arsenic content greater than 2 percent on any surface within the plant outside of a dust-tight enclosure"—ASARCO's comments on this objective of the management plan were: (1) This requirement can only be intepreted as meaning the entire plant would have to be placed within an enclosure; and (2) the costs of such an enclosure would be astronomical. The USWA commented that dry, dusty materials with arsenic concentrations well below 2 percent may contribute significantly to fugitive emissions from the plant, while damp materials with higher arsenic content would not contribute significantly. The USWA recommended that the regulation require clean-up or stabilization of dry materials containing more than 0.2 percent arsenic.

The rationale for requiring no accumulation and clean-up of arsenic-containing materials is that, as previously discussed, re-entrainment of part or all of the material is possible and re-entrained material is likely to be released to the atmosphere. The intent of the requirement was not, as suggested by ASARCO, to require enclosure of the entire plant, which is obviously not practicable. Instead, the intent was to focus attention on control of potentially significant sources of fugitive arsenic emissions from sources such as arsenic kitchen pulling or handling of baghouse dust and to exclude nonarsenic-bearing materials. The EPA considers the USWA's comment that the requirement should be limited to dry, dusty materials to be valid. Consequently, this objective has been reworded in the general work practices standard to require cleaning up or wetting of dry, dusty materials. The objective has not been revised as suggested by USWA to include materials with more than 0.2 percent arsenic because limiting the requirement to materials with more than 2 percent arsenic essentially requires cleanup or control of all sources in the arsenic plant.

"Immediate cleanup of any spilled material having an arsenic content greater than 2 percent"—ASARCO's comments on this objective were: (1) There is a housekeeping program in place as part of the OSHA/WISHA arsenic compliance requirements; (2) any clean-up requirements should be directed toward specific sources and materials and should be handled by a regulatory agency compliance requirement; and (3) the objective does not consider whether the material is likely to become airborne. The USWA comments on this proposed requirement were the same as its comments on the preceding requirement. The EPA reviewed ASARCO's housekeeping plan submitted to the Washington State Department of Labor and Industries and found that its scope was much narrower than intended by EPA's proposal. Thus, at present the existing housekeeping program cannot be considered an adequate substitute for the proposed objective.

The EPA believes this objective of the general work practice plan should be included in the standard to ensure that prompt attention is given to clean-up or control of spilled materials containing greater than 2 percent arsenic. It would not be practicable to identify every potential source in the regulation because of the large number of sources and materials processed at the facility. Unless this requirement is part of the regulation, EPA believes there would be no means of ensuring the attendant emission control. Therefore, the requirement has been included in the regulation.

"Regular scheduled maintenance of all smelter process, conveying, and emission control equipment to minimize equipment malfunctions"—Both ASARCO and USWA commented that this proposed objective is currently required by the Tripartite Agreement, and USWA further commented that it should be included in the final standard. This provision is being required to establish more explicit requirements for the arsenic plant than does the Tripartite Agreement. The standard includes this as a necessary part of an approvable housekeeping, inspection, and maintenance plan.

"Regular inspection to ensure equipment is operating properly"—ASARCO commented that there is an inspection procedure in place, and it is unreasonable to require the proposed inspection routine and documentation. In contrast, the USWA agreed with the proposed objective and recommended that the inspector document general housekeeping in each area to ensure plant surfaces are kept free of dry, dusty materials. Both ASARCO and USWA commented that it is unnecessary to require the inspector to follow a prescribed route. The EPA believes that the proposed regular inspection objective is a necessary element of the management plan to miminize fugitive and excess emissions and thus should be included in the standard. The proposed requirement of a prescribed route, however, has been deleted as it is unnecessary as long as all equipment and areas are inspected. The inspection and documentation of equipment status will ensure that malfunctioning equipment is quickly detected and will create a record that can be used to evaluate possible causes of higher than normal ambient arsenic concentrations. The EPA believes that regular inspection and documentation is necessary because ASARCO's correspondence with PSAPCA and EPA suggests that equipment malfunctions and upsets and other causes of higher than normal emissions are not systematically documented. Further, during the public hearing in Tacoma, ASARCO representatives confirmed that they do not have procedures which document all observed emissions and their causes. The EPA believes that such documentation is necessary to objectively pursue an effective emission control program. As suggested by the USWA, the inspection procedure has been expanded to include observation and documentation of housekeeping practices. The EPA believes that the inspection procedure and its required documentation will increase awareness of and emphasis on emission control.

"Repair of malfunctioning or damaged equipment"—ASARCO commented that they oppose the proposed requirements because the urgency of the repair is not related to the quantity of emissions to the air or impact on air quality. ASARCO also considered the proposal to be unreasonable because it would remove from ASARCO the discretion and authority to determine and take appropriate action. The USWA commented that it is not always practicable or necessary to shut down operations involving releases of material with more than 2 percent arsenic. The EPA considered these comments and consequently revised the proposed objective to require the company to submit a plan, subject to the approval of the Administrator, describing the actions that will be taken to curtail operations when process upsets and malfunctions of process, emission control, or material handling equipment occur that will result in increased emissions of arsenic. This plan will describe the time and actions required to curtail increased emissions due to malfunctions. The plan will also describe any technical limitations on curtailments. The EPA believes that this approach will allow sufficient flexibility to consider technical limitations and to consider whether specific individual malfunctions would increase emissions of inorganic arsenic to the atmosphere.

Arsenic trioxide production techniques. Both PSAPCA and NRDC recommended that EPA consider alternative arsenic trioxide production processes in the evaluation of best available controls for the ASARCO-Tacoma facility. These commenters recommended replacing the existing hot roasting process with a hydrometallurgical process as the best approach to reducing low-level arsenic emissions. Another commenter (the USWA) recommended that EPA require ASARCO to research alternative technologies for the production of arsenic trioxide and metallic arsenic.

The EPA has examined the status and applicability of hydrometallurgical processes to materials processed in the ASARCO-Tacoma arsenic production facility. The EPA is monitoring the development of hydrometallurgical processes and is aware of a number of processes that are being developed. Since flue dusts used in the ASARCO-Tacoma arsenic plant vary considerably in composition and contain impurities not found at other smelters, there is no known established process that can be readily applied at Tacoma. At this time, ASARCO is researching several processes for extracting arsenic from various flue dusts and is operating a pilot plant to evaluate further the feasibility of several processes recommended by the research department. Pilot plant operations began in September 1984.

The EPA is not requiring ASARCO to research alternative technologies for the production of arsenic trioxide and metallic arsenic for two reasons. First, the Tripartite Agreement among ASARCO, OSHA, and USWA already requires ASARCO to monitor and evaluate the development of alternative technologies for the production of arsenic trioxide and matallic arsenic. As previously indicated, EPA does not believe it is necessary to establish redundant standards when the measures required would be implemented even in the absence of EPA standards. Second, such a new requirement would have no impact because ASARCO is committed to, and is, in fact, already conducting pilot plant tests. Today's regulation does, however, require ASARCO to report to the Administrator the findings of studies conducted on the feasibility of alternative processes for producing arsenic trioxide. The EPA plans to continue to monitor the development of hydrometallurgical processes and the process changes to the arsenic trioxide plant, and to revise the regulation when appropriate.

Compliance Provisions

The Washington State DOE recommended that requirements for good operation and maintenance for process controls be included in the final regulation. The EPA agrees with DOE and, as described in the Summary of Promulgated Standard section of this preamble, the regulation includes provisions that require good operation and maintenance of process, conveying, and emission control equipment associated with the arsenic plant.

Reporting and Recordkeeping

The Washington State DOE recommended that the standard include recordkeeping and reporting requirements for malfunctions, upsets, and spills, and operation and maintenance provisions for control equipment. The Administrator considered this comment (and comments made at the public hearing that additional controls were needed) and concluded that additional inspection, maintenance, and recordkeeping requirements would be helpful in achieving better control of arsenic emissions. Consequently, the final standard requires regular inspection and maintenance of process, conveying, and emission control equipment as well as reporting of all malfunctions and process upsets that result in increased arsenic emissions.

ASARCO commented that it considers the monitoring, recordkeeping, and reporting requirements to be extremely burdensome and far beyond what is necessary, considering that emissions are negligible. The EPA believes that recordkeeping and reporting requirements are necessary to assist the Agency in identifying emission sources and to assist in enforcing the standard after the initial compliance demonstration. The final recordkeeping and reporting requirements will require on the average about 800 labor-hours per year over the first 3 years after the effective date of the standard. These requirements have been imposed because ambient arsenic concentrations around the facility are high, and fugitive emissions from the various operations in the facility, and in particular the arsenic plant, contribute significantly to ambient arsenic concentrations.

Ambient Limits

A number of commenters, local governmental agencies (PSAPCA and Washington State Department of Social and Health Services (DSHS)), and environmental groups, recommended that EPA establish an ambient arsenic standard which the ASARCO-Tacoma facility must achieve. It was also suggested that the standard should specify the monitoring and analytical techniques to be used. The PSAPCA specifically recommended that EPA establish 24-hour and annual average arsenic "action levels" to enforce implementation of a fugitive emission control program at the ASARCO-Tacoma facility. Conversely, other commenters argued that EPA should not establish an ambient standard for inorganic arsenic. The Washington DOE said that while it intends to establish 24-hour and annual average community exposure standard to limit inorganic arsenic emissions, it did not recommend that EPA adopt an ambient, or community exposure, standard. The DOE believes there is a need for flexibility in implementing such a standard applied to the ASARCO-Tacoma facility. Hence, in April 1984 the DOE adopted an interim ambient standard and plan to adopt permanent standards after evaluation and study of the causes of high ambient arsenic concentrations in the Tacoma area. The interim standard limits maximum 24-hour ambient concentrations of arsenic to 2.0 $\mu g/m^3$ and maximum annual average ambient concentrations of arsenic to 0.3 $\mu g/m^3$. The USWA and NRDC commented that an ambient standard for carcinogens is inappropriate and is not authorized under the Act. These commenters argued that an ambient standard is inappropriate because no safe level can be established for zero-threshold pollutants. These commenters did, however, believe that an ambient monitoring requirement and an "action level" used as an adjunct to enforcement would be useful and is authorized under the Act. The USWA specifically recommended: (1) That the action level should be achievable when all controls are working properly and should be revised periodically and (2) that exceedances of the action level should trigger an investigation by the company and a report to EPA. The USWA also recommended that the ambient monitoring requirement include provisions which require ASARCO to study and estimate regularly fugitive emissions from all sources in the plant, and to prepare and implement a management plan for control of fugitive emissions.

ASARCO commented on the legal authority and recommendations for an ambient arsenic standard or community exposure level. ASARCO commented that the language and legislative history of the Clean Air Act shows that section 112 does not empower EPA to set an enforceable ambient standard. ASARCO maintained that the clear thrust of section 112 is that EPA is responsible for adopting standards that limit continuously the amount of emissions of hazardous air pollutants from individual sources. ASARCO argued that an ambient standard would not be useful or appropriate because: (1) Ambient arsenic concentrations are presently and will continue to be monitored; (2) ambient concentrations around a source vary, depending on factors other them emissions, including meterological conditions and local terrain; (3) fugitive emissions are already will-controlled; and (4) there are no medical criteria that can be used to establish the level and averaging period of a standard. A further argument against an ambient standard presented by ASARCO was that an ambient standard would not be an effective means of reducing arsenic emissions. ASARCO commented that an ambient standard would have to be achieved either by emission controls or by production curtailments, and that EPA would have to identify sources of emissions causing high ambient arsenic levels and determine the controls required to attain the standard ASARCO pointed out that, in the case of a 24-hour standard, it would be difficult to determine what controls should be required because it is not possible to determine retroactively the causes of high ambient arsenic values. It was also argued that maintaining an ambient arsenic standard by intermittent production curtailment was not feasible. Curtailment is not a feasible approach to arsenic control because: (1) There is currently no real-time monitoring system for arsenic; (2) it is not practicable because of lack of knowledge about which sources should be curtailed; and (3) arsenic emission sources require lengthy shutdown periods before they cease emitting arsenic.

Since an enforceable ambient standard is not being established in the standard being promulgated today, ASARCO's comment (that section 112 of the Clean Air Act does not give EPA the authority to set enforceable ambient standards) is not pertinent to this rulemaking. The EPA agrees that an ambient standard cannot be established for inorganic arsenic based solely on health effects or risk estimates. The EPA does believe, however, that an enforceable ambient limit, which is an indicator of proper operation and maintenance of emission control systems and is developed considering all relevant factors, is consistent with the goals of Section 112 and may consider establishing a limit at a later date. This limit would serve as a direct measure of the degree to which fugitive arsenic emission sources at the arsenic production facilities are being controlled. The EPA intends to review ambient arsenic monitoring data in the future to determine if additional control measures are needed, and the standard requires quarterly reporting of ambient arsenic concentration monitoring data to facilitate this review. Among the measures that would be considered would be an enforceable boundary limit providing sufficient information and data are available to establish a limit. The enforceable boundary limit would be used to evaluate the effectiveness of required control measures and would not impose any additional emission control requirements. Thus, the enforceable boundary limit would not require production curtailments to achieve compliance with the limit. Hence, ASARCO's comments regarding the utility of an ambient standard are not applicable to the concept of the enforceable boundary limit.

Depending on the steps which ASARCO takes to reduce emissions in future operations of the arsenic plant, EPA plans to determine the need for additional control measures and the need for an enforceable boundary limit after the effects of the required control actions are assessed. This assessment will involve comparison of ambient levels of arsenic measured near the plant with ASARCO's records of operation at the arsenic plant. The EPA believes that this information will help to identify operating practices that cause high ambient concentrations, and the agree to which additional controls might reduce ambient arsenic concentration levels. In particular, exceedances of the DOE standard would be investigated to determine the cause and to determine possible control measures. The review may also consider the need for requiring periodic review of emissions and control measures to ensure the continued effectiveness of the housekeeping plan.

Impacts of Reporting and Recordkeeping Requirements

The EPA believes that the required reporting and recordkeeping requirements are necessary to assist the Agency in: (1) Identifying sources; (2) determining initial compliance; and (3) enforcing the standards.

The Paperwork Reduction Act (PRA) of 1980 (Pub. L. 96-511) requires that the Office of Management and Budget (OMB) approve reporting and recordkeeping requirements that qualify as an "information collection request" (ICR). To accommodate OMB review, EPA uses 3-year periods in its impact analysis procedures for estimating the labor-hour burden of reporting and recordkeeping requirements.

The average annual burden on owners and operators of arsenic trioxide and metallic arsenic production facilities to comply with the reporting and recordkeeping requirements of the final standard over the first 3 years after the effective date is estimated to be about 800 labor-hours.

VI. Negative Determinations

On July 20, 1983, EPA proposed not to establish standards limiting emissions of inorganic arsenic for six categories of sources. These sources were primary lead smelters, secondary lead smelters, primary zinc smelters, zinc oxide plants, cotton gins, and arsenic chemical manufacturing plants. The public comment period on these negative determinations ended on January 31, 1984. This part of the preamble presents the basis of the Administrator's decision to reaffirm the decision not to establish emission limits for these sources and responds to comments on the preposed action.

Summary of Decisions

The EPA identified the following six inorganic arsenic source categories, but concluded that standards were not warranted at this time: Primary lead smelters, primary zinc smelters, zinc oxide plants, arsenic chemical plants, secondary lead smelters, and cotton gins. The EPA has not developed standards for these source categories for the following reasons:

1. As a result of the existing level of control for these six source categories, maximum lifetime risk and annual incidence for each source category are generally small.

2. Requiring further controls under section 112 beyond OSHA and SIP requirements for either individual sources or for the six categories would not result in a significant reduction in maximum lifetime risk or annual incidence.

3. The EPA analyses indicate that severe economic impacts, including plant closure, could result if further control were required. The Agency does not believe that plant closure is a reasonable alternative.

The EPA believes that the cost of any additional controls that may be possible appear to far exceed any small incremental health benefit which might result. For the above reasons, the Agency believes that Federal regulation under section 112 of these six categories of sources of arsenic emissions is not currently warranted.

Significant Changes Since Proposal

No changes have been made in the Agency's decision not to regulate primary lead smelters, secondary lead smelters, primary zinc smelters, zinc oxide plants, cotton gins, and arsenic chemical manufacturing plants.

Additional Analyses

As a result of public comments, EPA conducted additional analyses to ensure that the decision whether to regulate primary lead smelters, primary zinc smelters, zinc oxide plants, arsenic chemical manufacturing plants, secondary lead smelters, and cotton gins is based on the most complete and accurate information available. Additional information on arsenic emissions and control technology was collected and analyzed for primary zinc smelters and secondary lead smelters. For primary zinc smelters, plant visits were conducted to verify the emission estimates and use of emission control equipment. During the plant visits, feedstock samples and process information were obtained to develop a material balance for estimating emissions. For secondary lead smelters, additional information was collected concerning the secondary lead industry. The current level of control practiced throughout the secondary lead industry was assessed in-depth. New nationwide arsenic emission estimates were made for secondary lead process sources and process and area fugitive sources based on EPA source testing. Risk analyses were performed based on these revised secondary lead emission estimates. These additional analyses undertaken for primary zinc smelters and secondary lead smelters are described in the responses to public comments.

Risk estimates, both maximum lifetime risk and annual incidence, for all six categories were revised by increasing the distance modeled from 20 km to 50 km (12 to 31 miles) from the source, by incorporating 1980 population data, and by more exactly locating the coordinates of some plant sites.

Basis for Decisions

This section presents the application of EPA's risk management approach in the review of the decision not to develop standards for the six source categories. The factors considered in the review were the risks posed by the sources, both maximum lifetime risk and annual incidence; the emission and risk reductions achievable through application of additional emission controls; and the costs and economic impacts of these control measures. The assessment of the risks and control options is summarized below.

Although the Agency did not perform site-specific air dispersion analysis for any of the six source categories which the Administrator has decided not to regulate under section 112, EPA has, where possible, made comparisons between the predicted and measured values. Generally, ambient data were not available in sufficient quantity to allow meaningful comparisons, but when obtained, the measured ambient values tended to be slightly higher than predicted by HEM for these source categories. This result is expected and reasonable since the ambient monitors would be affected by naturally-occurring arsenic in the soil and by other local arsenic sources that were not considered in EPA air dispersion analysis. The risk estimates ae given in Table VI-1.

More detailed information regarding the risk assessments for the source categories that remain unregulated under Section 112 may be found in the background information document (EPA-450/5-85-002). An explanation of EPA's risk management approach is found in the Overview—Basis for Promulgated Standards section of this preamble.

1. Secondary lead smelters. Maximum lifetime risk and annual incidence are small for most plants in this source category under the existing level of control. The highest annual incidence which occurs at one secondary lead smelter is 0.14, associated with a large exposed population (8.86 million within a 50 km radius). The EPA expects that OSHA and SIP requirements will lead to additional control to be implemented at this smelter as well as at many others. Fugutive sources are now largely controlled so that improvement, if possible, would be necessarily site-specific, and not practical or reasonable in a national standard. Due to the small maximum lifetime risk the probable inability to achieve further significant reductions in emissions and incidence, the potential negative societal and economic impacts that would result from additional control, and the difficulty in developing a uniform national standard, EPA has decided that regulation of secondary lead smelters under Section 112 is not currently warranted.

2. Cotton gins. For cotton gins, EPA developed "model" plants located in "model" locations for use in estimating maximum lifetime risks. However, with this approach, which was used since detailed location data were not available for all plants, the Agency cannot reasonably calculate aggregate or total risks to those living within 50 km (31 miles) of the gins. To look more closely at this category, EPA conducted an ambient monitoring study around two gins in the Texas area. When comparing the measured arsenic values to the predicted concentrations from the appropriate model gin exposure analysis, EPA found that the predicted values were reasonably close to concentrations measured very near the gins. The monitoring study data also showed that the arsenic concentrations fell off very rapidly with distance from the gins. This result suggests that people living at some distance from the gins are not being significantly exposed to the gins' emissions. Such a result, coupled with the observation that many gins are in rural areas, supports the Agency's conclusion that the aggregate risks for this source category are small.

The estimated maximum lifetime risks associated with the current level of process emission control from cotton gins is also small. There is not sufficient information available on the effectiveness of fugitive emission control techniques and such techniques have not been demonstrated to be applicable to all operational variabilities of cotton gins, leading the Agency to conclude that additional fugitive emission control is not reasonable. Taking these factors into consideration, the Agency has concluded: (1) That the existing level of control is acceptable because of the potential economic and societal consequences of gin closure and (2) that regulation of cotton gins under section 112 is not currently warranted.

3. Zinc oxide plants. Annual incidence estimates are small for both existing zinc oxide plants under current levels of control.

TABLE VI-1.—RISK ESTIMATES FOR SOURCE CATEGORIES FOR WHICH THE AGENCY IS NOT PROPOSING STANDARDS

Source category	Number of plants	Maximum individual risks	Aggregate risks (cases/yr)
Secondary lead smelters	35	4×10^{-4}	0.39
Cotton gins	~300	5×10^{-4}	....
Primary lead smelters	5	20×10^{-4}	0.07
Primary zinc smelters	5	0.07×10^{-4}	0.004
Zinc oxide plants	2	10×10^{-4}	0.08
Arsenic chemical plants	8	2×10^{-4}	0.004

The one plant where maximum lifetime risk is highest has process and fugitive controls in place. Existing controls and those planned for the near future to comply with OSHA and SIP regulations will reduce emissions and associated maximum lifetime risk from both plants. The EPA cannot identify any control requirements beyond those established by OSHA that would not result in closure of the plant associated with the highest maximum lifetime risk. Thus, EPA has decided that regulation of zinc oxide plants under section 112 is not warranted at this time.

4. Primary lead smelters. The annual incidence is small for all of the existing smelters under current levels of control. The highest predicted maximum lifetime risk which occurs at one smelter is 2×10^{-3}. Controls implemented at this plant as a result of recent tripartite agreements among OSHA, smelter management, and labor have already resulted in reduced ambient arsenic levels at this plant. Moreover, EPA has not identified any controls beyond those necessary to comply with OSHA and lead SIP requirements that could further reduce arsenic emissions to a significant degree. Thus, the Agency has concluded that section 112 regulation is not warranted at this time.

5. Primary zinc smelters. Annual incidence and maximum lifetime risk estimates are small for this source category under existing levels of control. No technology has been demonstrated that can reduce emissions further. Thus, the Agency has concluded that regulation under section 112 is not currently warranted.

6. Arsenic chemical manufacturing plants. Annual incidence and maximum lifetime risk estimates are small for this source category under existing levels of control. There are no demonstrated control techniques that would result in further emission reductions. Thus, the Agency has concluded that regulation of this soruce category under section 112 is not currently warranted.

Discussion of Comments

Comments on the decision not to propose standards for these source categories were solicited in the July 20, 1983, **Federal Register** (48 FR 33112). Eleven letters were received pertaining to these source categories. One of the parties who testified at the public hearing alluded to these source categories, and later submitted more detailed written comments. Comments concerned general topics that pertained to all six source categories as well as to particular source categories. Comments and Agency responses are presented here in the following order: General comments, secondary lead smelters, cotton gins, zinc oxide plants, primary lead smelters, primary zinc smelters, and arsenic chemical manufacturing plants. The docket reference is indicated in parentheses in each comment.

General Comments

The Attorney General's Office of the State of New York (A-83-09/IV-D-9, A-83-10/IV-D-12, A-83-11/IV-D-9, A-83-23/IV-D-9) submitted a list of companies located in New York and New Jersey, some of which are in the