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Part VI

Environmental Protection Agency

Standards of Performance for New Stationary Sources, Glass Manufacturing Plants

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 60]

[FRL 1203-7]

Standards of Performance for New Stationary Sources; Glass Manufacturing Plants

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule and notice of public hearing.

SUMMARY: The proposed standards would limit emissions of particulate matter from new, modified, and reconstructed glass manufacturing plants. The standards implement the Clean Air Act and are based on the Administrator's determination that glass manufacturing plants contribute significantly to air pollution. The intended effect is to require new, modified, and reconstructed glass manufacturing plants to use the best demonstrated system of continuous emission reduction, considering costs, nonair quality health and environmental impact, and energy impacts.

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

DATES: *Comments.* Comments must be received on or before August 14, 1979.

Public Hearing. The public hearing will be held on July 9, 1979 beginning at 9:30 a.m. and ending at 4:30 p.m.

Request to Speak at Hearing. Persons wishing to present oral testimony at the hearing should contact EPA by June 29, 1979.

ADDRESSES: *Comments.* Comments should be submitted to Central Docket Section (A-130), United States Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, Attention: Docket No. OAQPS 79-2.

Public Hearing. The public will be held at Office of Administration Auditorium, Research Triangle Park, North Carolina 27771. Persons wishing to present oral testimony should notify Mary Jane Clark, Emission Standards and Engineering Division (MD-13), Environmental Protection Agency, Rsearch Triangle Park, North Carolina 27711, telephone (919) 541-5271.

Standards Support Document. The support document for the proposes standards may be obained from the U.S. EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone number (919) 541-2777. Please refer to "Glass Manufacturing Plants, Background Information: Proposed Standards of Performance," EPA-450/3-79-005a.

Docket. A docket, number OAQPS 79-2, containing information used by EPA in development of the proposed standard, is available for public inspection between 8:00 a.m. and 4:00 p.m. Monday through Friday, at EPA's Central Docket Section (A-130), Room 2903 B, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT: Mr. Don R. Goodwin, Director, Emission Standards and Engineering Division (MD-13), Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5271.

SUPPLEMENTARY INFORMATION:

Proposed Standards

The standards would apply to glass melting furnaces with glass manufacturing plants with two exceptions: day pot furnaces (which melt two tons or less of glass per day) and all-electric melting furnaces. No existing plants would be covered unless they were to undergo modification or reconstruction. Change of fuel from gas to fuel oil would be exempt from consideration as a modification and rebricking of furnaces would be exempt from consideration as reconstruction.

Specifically, the proposed standards would limit exhaust emissions from gas-fired glass melting furnaces to 0.15 grams of particulate matter per kilogram of glass produced for flat glass production; 0.1 g/kg (0.2 lb/ton) for container glass production; 0.2 g/kg (0.4 lb/ton) for wool fiberglass production; 0.1 g/kg (0.2 lb/ton) for pressed and blown glass production of soda-lime formulation; and 0.25 g/kg (0.5 lb/ton) for pressed and blown glass production of borosilicate, opal, and other formulations. A 15 percent allowance above the emission limits for gas-fired furnaces is proposed for fuel oil-fired glass melting furnaces and an additional proportionate allowance is proposed for furnaces simultaneously firing gas and fuel oil.

Summary of Environmental and Economic Impacts

Environmental Impacts

The proposed standards would reduce projected 1983 emissions from new uncontrolled glass melting furnaces from about 5,200 megagrams (Mg)/year (5,732 ton/year) to about 400 Mg/year (441 ton/year). This is a reduction of about 92 percent of uncontrolled emissions. Meeting a typical State Implementation Plan (SIP), however, would reduce emissions from new uncontrolled furnaces by about 3,700 Mg/year (4,079 ton/year), or by about 70 percent. The proposed standard would exceed the reduction achieved under a typical SIP by about 1,100 Mg/year (1,213 ton-year). This reduction in emissions would result in a reduction of ambient air concentrations of particulate matter in the vicinity of new glass manufacturing plants.

The proposed standards are based on the use of electrostatic precipitators (ESP's) and fabric filters, which are dry control techniques; therefore, no water discharge would be generated and there would be no adverse water pollution impact.

The solid waste impact of the proposed standards would be minimal. Less than 2 Mg (2.2 ton) of particulate would be collected for every 1,000 Mg (1,102 ton) of glass produced. These dusts can generally be recycled, or they can be landfilled if recycling proves to be unattractive. The current solid waste disposal practice among most controlled plants surveyed is landfilling. Since landfill operations are subject to State regulation, this disposal method would not be expected to have an adverse environmental impact. The additional solid material collected under the proposed standard would not differ chemically from the material collected under a typical SIP regulation; therefore, adverse impact from landfilling should be minimal. Also, recycling of the solids has no adverse environmental impact.

For typical plants in the glass manufacturing industry, the increased energy consumption that would result from the proposed standards ranges from about 0.1 to 2 percent of the energy consumed to produce glass. The energy required in excess of that required by a typical SIP regulation to control all new glass melting furnaces constructed by 1983 to the level of the proposed standards would be about 2,500 kilowatt-hours per day in the fifth year and is considered negligible. Thus, the proposed standards would have a minimal impact on national energy consumption.

Economic Impacts

The economic impact of the proposed standards is reasonable. Compliance with the standards would result in annualized costs in the glass manufacturing industry of about $8.5 million by 1983. For typical plants constructed between 1978-1983 capital costs associated with the proposed standards would range from about $235,000 for a small furnace in the pressed and blown glass sector which melts formulations other than soda lime to about $770,000 for a large pressed and blown glass furnace which melts soda-lime formulations. Annualized costs associated with the proposed standards would range from about $70,000/year to about $225,000/year for the furnaces mentioned above. Cumulative capital costs of complying with the proposed standards for the glass manufacturing industry as a whole would amount to about $28 million between 1979–1983. The percent price increase necessary to offset costs of compliance with the proposed standards would range from about 0.2 percent in the wool fiberglass sector to about 1.8 percent in the container glass sector. Industry-wide, the price increase would amount to about 0.7 percent.

The economic impact of the proposed standards may vary depending on the size of the glass melting furnace being considered. EPA is requesting comments specifically on the economic impact of the proposed standards with regard to a possible lower cut-off size for glass melting furnaces.

Rationale

Selection of Source and Pollutants

The proposed Priority List, 40 CFR 60.16, identifies various sources of emissions on a nationwide basis in terms of the quantities of emissions from source categories, the mobility and competitive nature of each source category, and the extent to which each pollutant endangers health or welfare. The sources on this proposed list are ranked in decreasing order. Glass manufacturing ranks 38th on the proposed list, and is therefore of considerable importance nationwide.

The production of glass is projected to increase at compounded annual growth rates of up to 7 percent through the year 1983. In 1975, over 17 million megagrams (18.8 million ton) of glass were produced; by 1983 this production rate is expected to increase by nearly 2.9 million Mg/year (3.2 million ton/year). Geographically, the glass manufacturing industry is relatively concentrated with plants currently located in 17 states. Total particulate emissions in the United States in 1975 were estimated to be about 12.4 million Mg/year (13.7 million ton/year); by the year 1983 new glass manufacturing plants would cause annual nationwide particulate matter emissions to increase by about 1,500 Mg/year (1,650 ton/year) with emissions controlled to the level of a typical SIP regulation.

On March 18, 1977, the Governor of New Jersey petitioned EPA to establish standards of performance for glass manufacturing plants. The petition was primarily motivated by the Governor's concern that the glass manufacturing industry might locate plants in other States rather than comply with New Jersey's air pollution regulations limiting emissions of particulate matter. The glass manufacturing industry is not geographically tied to either markets or resources. Only a few States have specialized air pollution standards for glass manufacturing plants in their SIP's, and these standards vary in the level of control required. Therefore, new glass manufacturing operations could be located in States which do not have stringent SIP regulations.

Glass manufacturing plants are significant contributors to nationwide emissions of particulate matter, especially when viewed as contributors to emissions in the limited number of States in which they are located. They rank high with regard to potential reduction of emissions. Since they are free to relocate in terms of both markets and required resources, the possibility exists that operations could be moved or relocated to avoid stringent SIP regulations, thereby generating economic dislocations. For these reasons, emissions of particulate matter from new glass manufacturing plants have been selected for control by NSPS.

Glass manufacturing plants also emit other criteria pollutants: sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide, and hydrocarbons. Carbon monoxide and hydrocarbon emissions from efficiently operated glass manufacturing plants, however, are negligible.

Nationwide, the largest aggregate emissions from glass manufacturing plants are NO_x. The techniques generally applicable to control NO_x produced by combustion are staged combustion, off-stoichiometric combustion, or reduced-temperature combustion. To date none of these techniques has been applied to the control of NO_x emissions from glass melting furnaces. Accordingly, there is no way of determining how effective they might be in such applications. Consequently, NO_x was not selected for control by standards of performance.

SO_2 emissions result from combustion of sulfur-containing fuels and from chemical reactions of raw materials. In general there are two alternatives for control of SO_2 emissions: (1) scrubbing of exhaust gases containing SO_2, and (2) reducing the sulfur content of fuel and raw materials. SO_2 emissions from glass melting furnaces are in most cases already less than the emission limits of applicable SIP's for fuel burning sources. Flue-gas scrubbing for control of SO_2 emissions from glass melting furnaces is not considered economically reasonable.

There are difficulties as well with the use of low-sulfur fuels or reduction of sulfur content of raw materials. Using low-sulfur fuel would not adequately address the problem of SO_2 control for two reasons. Natural gas is the preferred fuel for glass melting furnaces. The only alternative fuel currently in use or projected for future use by the glass manufacturing industry is distillate fuel oil, which normally contains more sulfur than natural gas. The elimination of sulfur-containing fuel oil is not considered reasonable. Alternatively, standards of performance based solely on combustion of low-sulfur fuels could distort existing fuel distribution patterns, since low-sulfur fuels would be diverted to new facilities to meet NSPS in areas that have no difficulty attaining or maintaining the National Ambient Air Quality Standards (NAAQS) for SO_2. This would reduce the supply of low-sulfur fuels for existing facilities in areas that have great difficulty attaining or maintaining the NAAQS for SO_2. Consequently, standards of performance for SO_2 emissions based on use of low-sulfur fuels do not seem reasonable.

Use of reduced-sulfur raw materials has not been demonstrated as a means of reducing SO_2 emissions from glass melting furnaces. There is a wide variety of formulations, most of which are considered by the industry to be trade secrets. The present state of glass making is such that formula alterations of the type envisioned here would lead to glass of unpredictable quality. For these reasons, standards of performance for SO_2 emissions from glass melting furnaces based on reduced-sulfur raw materials, or any other approach, do not seem reasonable and have not been proposed.

Selection of Affected Facility

Ninety-eight percent of the particulate matter emitted from glass manufacturing plants is emitted in gaseous exhaust streams from glass melting furnaces. Only two percent of the particulate matter emitted from glass manufacturing plants is emitted from raw material handling and glass forming and finishing. Therefore, the glass melting furnace has been selected as the affected facility.

The proposed standards would apply to all glass melting furnaces within glass manufacturing plants with two exceptions: day pot furnaces and all-electric melters. A day pot furnace is a glass melting furnace which is capable of producing no more than two tons of glass per day. These small glass melting furnaces constitute an extremely small percentage of total glass production and their control is not considered economically reasonable. Therefore, the regulation exempts day pot furnaces from the proposed standards.

Well operated and maintained all-electric furnaces have particulate emissions only slightly higher than fossil-fuel fired furnaces controlled to meet the proposed standards. Most of these furnaces are open to the atmosphere and do not have stacks. Thus, control and measurement of emissions from all-electric furnaces does not appear to be economically reasonable. Therefore, all-electric melting furnaces are not regulated by the proposed standards.

Selection of Format

Two alternative formats were considered for the proposed standards: mass standards, which limit emissions per unit of feed to the glass furnace or per unit of glass produced by the glass furnace; and concentration standards, which limit emissions per unit volume of exhaust gases discharged to the atmosphere.

Enforcement of concentration standards requires a minimum of data and information, decreasing the costs of enforcement and reducing chances of error. Furthermore, vendors of emission control equipment usually guarantee equipment performance in terms of the pollutant concentration in the discharge gas stream.

There is a potential for circumventing concentration standards by diluting the exhaust gases discharged to the atmosphere with excess air, thus lowering the concentration of pollutants emitted but not the total mass emitted. This problem can be overcome, however, by correcting the concentration measured in the gas stream to a reference condition such as a specified oxygen percentage in the gas stream.

Concentration standards would penalize energy-efficient furnaces, since a decrease in the amount of fuel required to melt glass decreases the volume of gases released but not the quantity of particulate matter emitted. As a result, the concentration of particulate matter in the exhaust gas stream would be increased even though the total mass emitted remained the same. Even if a concentration standard were corrected to a specified oxygen content in the gas stream, this penalizing effect of the concentration would not be overcome.

Primary disadvantages of mass standards, as compared to concentration standards, are that their enforcement is more costly and that the more numerous calculations required increase the opportunities for error. Determining mass emissions requires the development of a material balance on process data concerning the operation of the plant, whether it be input flow rates or production flow rates. Development of this balance depends on the availability and reliability of production figures supplied by the plant. Gathering of these data increases the testing or monitoring necessary, the time involved, and, consequently, the costs. Manipulation of these data increases the number of calculations necessary; e.g., the conversion of volumetric flow rates to mass flow rates, thus compounding error inherent in the data and increasing the chance for error.

Although concentration standards involve lower resource requirements than mass standards, mass standards are more suitable for regulation of particulate emissions from glass melting furnaces because of their flexibility to accommodate process improvements and their direct relationship to quantity of particulate emitted to the atmosphere. These advantages outweigh the drawbacks associated with creating and manipulated a data base. Consequently, mass standards are selected as the format for expressing standards of performance for glass melting furnaces.

The proposed standards express allowable particulate emissions in grams of particulates per kilogram of glass pulled. While emissions data referring to raw material input as well as data referring to glass pulled were used in the development of the standards, an examination of the several sectors of the glass manufacturing industry indicated that an emission rate based on quantity of glass pulled would be more representative of industry practice. Further, emissions are more dependent on pull rate than on rate of raw material input. Accordingly, the mass of glass pulled is used as the denominator in the proposed standards. Raw material input data could be employed to estimate glass pulled from a furnace if a quantitative relationship between raw material input and glass pulled were developed following good engineering methods.

Selection of the Best System of Emission Reduction and Emission Limits

Introduction

Particulate emissions from glass melting furnaces can be reduced significantly by the use of the following emission control techniques: electrostatic precipitators, fabric filters, and venturi scrubbers. Since these emission control techniques do not achieve the same level of control for glass melting furnace emissions within all sectors of the glass manufacturing industry, they are discussed separately for each sector.

Process modifications such as batch formulation alteration and electric boosting also may be capable of reducing particulate emissions from glass melting furnaces. The test data available for furnaces where process modifications are used as emissions reduction techniques indicate that emission reduction by process modification is indefinite with respect to the effectiveness of the techniques. Accordingly, the selection of the best system of emission reduction is based on the use of add-on emission reduction techniques of known effectiveness. However, there is nothing in this proposal nor is it the intent of this proposal to preclude the use of process modifications to comply with the proposed standards.

The glass manufacturing industry is divided into four principal sectors designated by Standard Industrial Classifications (SIC's). The container glass sector (SIC 3221) manufactures containers for commercial packing and bottling and for home canning by pressing (stamping) and/or blowing (air-forming) molten glass usually of soda-lime recipe. The pressed and blown glass, not elsewhere classified, sector (SIC 3229) includes such diverse products as: table, kitchen, art and novelty glassware; lighting and electronic glassware; scientific, technical, and other glassware; and textile glass fibers. Based on the differing rates of particulate matter emissions, it is necessary to subdivide the pressed and blown glass sector into plants producing glass from soda-lime formulations and plants producing glass from other formulation (primarily borosilicate, opal and lead). Glass manufacturing plants in the wool fiberglass sector are classified under mineral wool (SIC 3296); fiberglass insulation is a major product. The flat glass sector (SIC 3211) uses continuous glass forming processes, and materials almost exclusively of soda lime formulation, to manufacture sheet, plate, float, rolled, and wire glass.

Each of the glass manufacturing sectors is unique both from a technical and an economic standpoint. Thus, uncontrolled particulate emission rate, furnace size, and the applicability of emission control techniques vary from one sector to another. Since the products manufactured by the different sectors of the glass manufacturing industry serve different markets, each sector is working in a different economic environment. For these reasons it was apparent that no single model furnace could adequately characterize the glass manufacturing industry. Accordingly, several model furnaces were specified in terms of the following parameters: production rate, stack height, stack diameter, exhaust gas exit velocity, exhaust gas flow rate, and exhaust gas temperature. The evaluation of these parameters may be found in the Background Information document. The model furnace production rate specified for the container glass sector was 225 Mg/day (250 ton/day). For pressed and blown glass furnaces melting soda-lime and other formulations two model furnace production rates were specified: 45 Mg/day (50 ton/day) and 90 Mg/day (100 ton/day). Model furnace production rates for the wool fiberglass and flat glass sector were 180 Mg/day (200 ton/day) and 635 Mg/day (700 ton/day), respectively.

Review of the performance of the emission control techniques led to the identification of two regulatory options for each sector. These options specify numerical emission limits for glass melting furnaces in each sector of the glass manufacturing industry. The environmental impacts, energy impacts, and cost and economic impacts of each regulatory option were compared with those associated with a typical SIP regulation and those associated with no control.

Container Glass

Uncontrolled particulate emissions from container glass furnaces are generally about 1.25 g/kg (2.5 lb/ton) of glass pulled. Emission tests (using EPA Method 5) on three container glass furnaces equipped with ESP's indicate an average particulate emission of 0.06 g/kg (0.12 lb/ton) of glass pulled.

Emission test data for container glass furnaces equipped with fabric filters are not available. However, emission test results for a pressed and blown glass furnace melting a soda-lime formulation essentially identical to that used for container glass indicate that emissions can be reduced to 0.12 g/kg (0.24 lb/ton) of glass pulled with a fabric filter. This fabric filter installation was tested with the Los Angeles Air Pollution Control District particulate matter test method (LAAPCD Method), which considers the combined weight of the particulate matter collected in water-filled impingers and of that collected on a filter. EPA Method 5 also uses impingers and a filter, but considers only the weight of the particulate matter collected on the filter. The LAAPCD Method collects a larger amount of particulate matter than does EPA Method 5, and, consequently, greater mass emissions would be reported for comparable tests. An emission level of 0.1 g/kg (0.2 lb/ton) as determined by EPA Method 5, could be achieved by a container glass furnace equipped with a properly designed and operated fabric filter.

EPA Method 5 tests of four furnaces equipped with venturi scrubbers indicated an average particulate emission of 0.21 g/kg (0.42 lb/ton) of glass pulled.

Based on the data cited above, an emission level of 0.1 g/kg (0.2 lb/ton) of glass pulled from container glass furnaces can be achieved with ESP's or fabric filters. An emission level of 0.2 g/kg (0.4 lb/ton) of glass pulled can reasonably be achieved with a venturi scrubber when operated at a pressure drop somewhat higher than the average of those scrubbers tested. ESP's and fabric filters could also be designed to achieve an emission level of 0.2 g/kg (0.4 lb/ton) of glass pulled.

On the basis of these conclusions, two regulatory options for reducing particulate emissions from container glass furnaces were formulated. Option I would set an emission limit of 0.1 g/kg (0.2 lb/ton), requiring a particulate emission reduction of somewhat over 90 percent as compared with an uncontrolled furnace. Option II would set an emission limit of 0.2 g/kg (0.4 lb/ton), requiring a particulate emission reduction of about 85 percent.

By 1983 approximately 1900 gigagrams (Gg)/year (2.1 million ton/year) of additional production is anticipated in the container glass sector. About 25 new container glass furnaces of about 225 Mg/day (250 ton/day) production capacity (the size of the model furnace) would be built in order to provide this additional production. If uncontrolled, these new container glass furnaces would add about 2,400 Mg/year (2,646 ton/year) to national particulate emissions by 1983. Compliance with a typical SIP regulation would reduce this impact to about 1,000 Mg/year (1,102 ton/year). Under Option I, emissions would be reduced to about 10 percent of those emitted under a typical SIP regulation. Under Option II, emissions would be reduced to about 20 percent of those emitted under a typical SIP regulation.

Ambient dispersion modeling indicates that under worst case conditions the annual maximum ground-level particulate concentration near an uncontrolled container glass furnace producing 225 Mg/day of glass would be less than 1 μg/m³. The annual maximum ground-level concentration resulting from compliance with a typical SIP regulation, Option I, or Option II would also be less than 1 μg/m³. The calculated maximum 24-hour ground-level particulate concentration near an uncontrolled container glass furnace producing 225 Mg/day of glass would be approximately 10 μg/m³. The corresponding concentration for complying with a typical SIP regulation would be 6 μg/m³. Under Option I, with an ESP or a fabric filter being employed for control, the maximum 24-hour ground-level concentration would be reduced to 1 μg/m³. Under Option II, with the same techniques being employed, the concentration would be reduced to 2 μg/m³. Use of a venturi scrubber to meet the Option II emissions limit would only reduce the concentration to 8 μg/m³ due to the decreased stack height of a scrubber-controlled plant and the resulting increased building wake effects.

With one exception, standards of performance for container glass furnaces would have no water pollution impact. The exception would be the use of a venturi scrubber to comply with a standard based on Option II. Such a system, applied to a furnace producing 225 Mg/day of glass, would discharge about 0.5 m³/hr of waste water containing about 5 percent solids. The waste water would probably be discharged directly to an available waste water treatment system. To date, however, only a few container glass furnaces have been controlled with venturi scrubbers; dry collection techniques have been preferred. Consequently, few container glass manufacturers would be expected to install venturi scrubbers on their furnaces to comply with a standard based on Option II. The overall water pollution impact would then be negligible.

The potential solid waste impacts of the regulatory options would result from collected particulate matter. Solid waste from container glass furnaces, other than collected particulate matter, is minimal since cullet is normally recycled back into the glassmaking process. Under a typical SIP regulation, about 1,400 Mg/year (1,543 ton/year) of particulate matter would be collected from the 25 new 225 Mg/day container glass furnaces projected to come on-stream during the 1978–1983 period. Compliance with standards based on Option I and Option II would add about 800 Mg/year (882 ton/year) and about 600 Mg/year (661 ton/year), respectively, to the solid waste collected under a typical SIP regulation. Option I would increase the mass of solids for disposal by about 60 percent over that resulting from compliance with a typical SIP regulation, and Option II would increase it by about 45 percent. The additional solid material collected under Option I or Option II would not differ chemically from the material collected under a typical SIP regulation. Collected solids either are recycled back into the glass melting process or are disposed of in a landfill. Recycling of the solids has no adverse environmental impact, and, since landfill operations are subject to State regulation, this disposal method also would not be expected to have an adverse environmental impact.

The potential energy impacts of the regulatory options would be due to the energy used to drive the fans in emission control systems and the energy used to charge the electrodes in ESP's. Since ESP's have been the predominant control system used in the industry, the energy requirements estimated for a typical SIP regulation, Option I and Option II were based on the use of ESP's. The energy required to control particulate emissions from the 25 new container glass furnaces would be about 40 million kWh (22 thousand barrels of oil/year) for a typical SIP regulation for the new furnaces equipped with ESP's. This required energy would be about 0.2 percent of the total energy use in the container glass sector. There would be no energy impact associated with either Option I or Option II because the energy required to operate an ESP for Option I or Option II is essentially the same as the energy required to operate an ESP for a typical SIP regulation.

Incremental installed cost (cost in excess of a typical SIP regulation cost) in January 1978 dollars associated with Option I for controlling particulate emissions from a 225 Mg/day container glass furnace would be about $700 thousand for an ESP and about $1.2 million for a fabric filter. Incremental installed cost associated with Option II would be about $450 thousand for an ESP, and about $1 million for a fabric filter. The incremental installed cost of control equipment associated with Option I level of control would be about 1.6 times the incremental installed cost associated with Option II if ESP's were selected. If fabric filters were selected, the incremental installed cost associated with the Option I level of control would be about 1.2 times the incremental installed cost associated with Option II.

Incremental annualized costs associated with Option I for a 225 Mg/day furnace would be about $200 thousand/year and about $350 thousand/year for an ESP and a fabric filter, respectively. Incremental annualized costs associated with Option II would be about $130 thousand/year for an ESP, and about $300 thousand/year for a fabric filter. The incremental annualized cost associated with Option I would be about 1.5 times the incremental annualized cost associated with Option II if ESP's were used. If fabric filters were used the incremental annualized cost associated with Option I would be about 1.2 times the incremental annualized cost associated with Option II.

Based on the use of control equipment with the highest annualized cost (worst case conditions), a price increase of about 1.8 percent would be necessary to offset the cost of installing control equipment on a 225 Mg/day container glass furnace to meet the emissions limit of Option I. A price increase of about 1.5 percent would be necessary to comply with the emission limit of Option II.

Incremental cumulative capital costs for the 25 new 225 Mg/day container glass furnaces during the 1978–1983 period associated with Option I would be about $17 million if ESP's were used. Use of ESP's to comply with a standard based on Option II would require incremental cumulative capital costs of about $11 million for the same period. Fifth-year annualized costs for controlling container glass melting furnaces to comply with Option I would be about $5 million/year. To comply with Option II, fifth-year annualized costs would be about $3 million/year.

A summary of incremental impacts (in excess of impacts of a typical SIP regulation) associated with Option I and Option II is shown in Table 1. Air impacts, expressed in Mg/year of particulate matter emissions reduced, would approximate the quantity of particulate matter collected and disposed of as solid waste.

Table 1.—*Summary of Incremental Impacts Associated With Regulatory Options*

	Impacts			
	Air [1]	Water	Energy [2]	Economic [3]
Regulatory option:				
I	800	None	Negligible	~1.8
II	600	Negligible	Negligible	~1.5

[1] Mg/Yr. reduced.
[2] Barrels of oil/day.
[3] Percent price increase.

Consideration of the beneficial impact on national particulate emissions, the degree of water pollution impact, the small potential for adverse solid waste impact, the lack of energy impact, the reasonableness of cost impact, and the general availability of demonstrated emission control technology leads to the selection of Option I as the basis for standards for glass melting furnaces in the container glass sector.

Pressed and Blown Glass—Soda-Lime Formulation

Because the glass production rates, the furnace configurations, and the glass formulations melted in furnaces in this sector are very similar to those in container glass sector, the quantity and chemical composition of particulate emissions approximate those of container glass furnaces. On the basis of this similarity of process and emissions, the emission reduction techniques which have been shown to be effective for container glass furnaces would also be effective in reducing particulate emissions from furnaces in this sector.

Uncontrolled particulate emissions from pressed and blown glass furnaces melting soda-lime formulations are generally about 1.25 g/kg (2.5 lb/ton) of glass pulled from the furnace. Test data for a pressed and blown glass furnace melting a soda-lime formulation and equipped with a fabric filter indicate particulate emissions of 0.12 g/kg (0.24 lb/ton) of glass pulled using the

LAAPCD Method. No emissions data for pressed and blown glass furnaces equipped with ESP's are available. However, emission tests using EPA Method 5 on three container glass furnaces equipped with ESP's indicate an average particulate emission rate of 0.06 g/kg (0.12 lb/ton) of glass pulled. Because of the similarities between this sector and the container glass sector, both ESP's and fabric filters would be expected to be capable of reducing emissions to about 0.1 g/kg (0.2 lb/ton) of glass pulled.

Based on the similarity of pressed and blown glass production methods in this sector to those of the container glass sector, as well as on test data available on container glass furnace emissions, two regulatory options were formulated. The regulatory options are identical to those formulated for container glass furnaces. Option I would set an emission limit of 0.1 g/kg (0.2 lb/ton) of glass pulled, which would require a particulate emission reduction of about 90 percent. Option II would set an emission limit of 0.2 g/kg (0.4 lb/ton) of glass pulled, which would require about 85 percent particulate emission reduction.

By 1983 approximately 310 Mg/year (342 ton/year) of additional production is anticipated in this glass manufacturing sector. About four new 45 Mg/day (50 ton/day) (small) and six new 90 Mg/day (100 ton/day) (large) furnaces would be built in order to provide this production. Emissions from the large furnaces would have to be reduced in order to comply with a typical SIP regulation, while small furnaces would meet a typical SIP regulation without reducing emissions. If uncontrolled, the four new small furnaces would add about 80 Mg/year (88 ton/year) to national particulate emissions by 1983, while the six new large furnaces would add about 230 Mg/year (254 ton/year). Compliance with a typical SIP regulation would reduce the impact of the new large furnaces to about 70 Mg/year (77 ton/year). Under Option I, these furnace emissions would be reduced to about 26 percent of those emitted under a typical SIP regulation. Under Option II, large furnace emissions would be reduced to about 53 percent of those emitted under a typical SIP regulation.

The small furnaces would be in compliance with a typical SIP regulation without control. Under Option I, emissions would be reduced to about 6 percent of uncontrolled emissions. Under Option II, emissions would be reduced to about 10 percent of uncontrolled emissions.

The effect of a typical SIP regulation for both 90 Mg/day (100 ton/day) and 45 Mg/day (50 ton/day) furnaces would be a reduction of about 40 percent of uncontrolled emissions. Under Option I, emissions would be reduced to about 15 percent of those emitted under a typical SIP regulation. Under Option II, emissions would be reduced to about 30 percent of those emitted under a typical SIP regulation.

Ambient dispersion modeling indicates that under worst case conditions the annual maximum ground-level particulate concentration near an uncontrolled pressed and blown glass furnace producing 45 Mg/day of glass would be less than 1 $\mu g/m^3$, as would the concentrations resulting from compliance with Option I or Option II. Corresponding annual maximum ground-level concentrations near an uncontrolled pressed and blown glass furnace producing 90 Mg/day of glass would also be less than 1 $\mu g/m^3$. Emissions from uncontrolled furnaces of either size in this sector would result in calculated maximum 24-hour ground-level concentrations of 3 $\mu g/m^3$. Under Option I this concentration would be reduced to below 1 $\mu g/m^3$. Under Option II it would be reduced to about 1 $\mu g/m^3$.

Since fabric filters and electrostatic precipitators are likely to be the control systems installed on furnaces in this sector to comply with standards, there would be no water pollution impact associated with standards based on either Option I or Option II.

Under a typical SIP regulation, no particulate matter would be collected from the four new 45 Mg/day pressed and blown glass furnaces projected to come on-stream during the 1978–1983 period. The six new 90 Mg/day furnaces would collect about 160 Mg/year (176 ton/year) under a typical SIP regulation. For the six 90 Mg/day furnaces the amounts collected in addition to those collected through compliance with a typical SIP regulation would be about 50 Mg/year (55 ton/year) for Option I and about 30 Mg/year (35 ton/year) for Option II. Compliance with standards based on Option I and Option II would result in the collection of about 72 Mg/year (79 ton/year) and about 68 Mg/year (75 ton/year), respectively, of solid waste from the four 45 Mg/day furnaces. Option I would increase the mass of solids for disposal by 100 percent and by about 31 percent over that required by a typical SIP regulation for 45 Mg/day and 90 Mg/day furnaces, respectively. Option II would increase the mass of solids for disposal by 100 percent and 21 percent over that required by a typical SIP regulation for 45 Mg/day and 90 Mg/day furnaces, respectively. The total masses of solids for disposal collected from all new furnaces would be about 122 Mg/year (135 ton/year) and 101 Mg/year (111 ton/year) for Option I and Option II, respectively.

The additional solid material collected under Option I and Option II would not differ chemically from the material collected under a typical SIP regulation. Collected solids either are recycled back into the glass melting process or are disposed of in a landfill. Recycling of the solids has no adverse environmental impact, and, since landfill operations are subject to State regulation, this disposal method also would not be expected to have an adverse environmental impact.

Since the four new 45 Mg/day furnaces would be in compliance with a typical SIP regulation without add-on controls, there would be no associated energy requirement. The estimated energy required to control particulates emissions from the four new 45 Mg/day furnaces projected to come on-stream in the 1978–1983 period to the levels required by both Option I and Option II would be about 1.5 million kWh (900 barrels of oil/year). The energy required to control particulate emissions from the six new 90 Mg/day furnaces would be 4.4 million kWh (2,600 barrels of oil/year) for a typical SIP regulation, Option I, or Option II if ESP's were installed.

The energy required to comply with the emission limits of the regulatory options would be about 0.5 percent of the total energy use in this glass manufacturing sector. The energy impacts of both Option I and Option II are negligible (~3 barrels of oil/day) for the new 45 Mg/day furnaces. There would be no energy impact associated with either Option I or Option II for the new 90 Mg/day furnaces beyond the impact associated with the requirements to meet a typical SIP regulation.

Incremental installed costs in January 1978 dollars associated with Option I for controlling particulate emissions from a 45 Mg/day pressed and blown glass furnace melting soda-lime formulations would be about $740 thousand for an ESP and about $740 thousand for a fabric filter. Incremental installed costs associated with Option II would be about $645 thousand for an ESP, and about $675 thousand for a fabric filter. The incremental installed costs of control equipment associated with the Option I level of control would be about 1.1 times the incremental installed costs associated with Option II if ESP's were selected. If fabric filters were selected the incremental installed costs associated with the Option I level of control would be about 1.1 times the incremental installed costs associated with Option II.

Incremental annualized costs for a 45 Mg/day furnace associated with Option I would be about $280 thousand/year for both ESP's and fabric filters. Incremental annualized costs associated with Option II would be about $205 thousand/year for an ESP, and about $215 thousand/year for a fabric filter. The incremental annualized costs associated with Option I would be about 1.1 times the incremental annualized costs associated with Option II if ESP's were used. If fabric filters were used, the incremental annualized costs associated with Option I would be about 1.1 times the incremental annualized costs associated with Option II.

Based on the use of control equipment with the highest annualized costs (worse case conditions), a price increase of about 0.6 percent would be necessary to offset the costs of installing control equipment on a 45 Mg/day pressed and blown glass furnace melting soda-lime formulations to meet the emission limits of Option I. A price increase of about 0.5 percent would be necessary to comply with the emission limits of Option II.

Incremental cumulative capital costs for the 1978–1983 period associated with Option I for the four new 45 Mg/day furnaces would be about $[illegible] million if a fabric filter were used. Use of an ESP to comply with Option II would require incremental cumulative capital costs of about $2.6 million for the same period. Fifth-year annualized costs for controlling the furnace to comply with Option I would be about $[illegible] thousand. To comply with Option II, fifth-year annualized costs would be about $[illegible] thousand.

Incremental installed costs in January 1978 dollars associated with Option I for controlling particulate emissions from a 90 Mg/day pressed and blown glass furnace melting soda-lime formulations would be about $615 thousand for an ESP and about $770 thousand for a fabric filter. Incremental installed costs associated with Option II would be about $450 thousand for an ESP, and about $890 thousand for a fabric filter. The incremental installed costs of control equipment associated with the Option I level of control would be about 1.4 times the incremental installed costs associated with Option II, if ESP's were selected. If fabric filters were selected the incremental installed costs associated with the Option I level of control would be about 1.1 times the incremental installed costs associated with Option II.

Incremental annualized costs for a 90 Mg/day furnace associated with Option I would be about $[illegible] thousand/year and about $[illegible] thousand/year for an ESP and a fabric filter, respectively. Incremental annualized costs associated with Option II would be about $130 thousand/year for an ESP, and about $[illegible] thousand/year for a fabric filter. The incremental annualized costs associated with Option I would be about 1.3 times the incremental annualized costs associated with Option II if ESP's were used. If fabric filters were used the incremental annualized costs associated with Option I would be about 1.1 times the incremental annualized costs associated with Option II.

Based on the use of control equipment with the highest annualized cost, a price increase of about 0.6 percent would be necessary to offset the costs of installing control equipment on the large pressed and blown glass furnace melting soda-lime formulations to meet the emission limits of Option I. A price increase of about 0.5 percent would be necessary to comply with the emission limits of Option II.

Incremental cumulative capital costs for the 1978–1983 period associated with Option I for the six new 90 Mg/day furnaces would be about $3.7 million if ESP's were used. Use of ESP's to comply with Option II would require incremental cumulative capital costs of about $2.7 million for the same period. Fifth-year annualized costs for controlling these glass melting furnaces to comply with Option I would be about $1.1 million. To comply with Option II, fifth-year annualized costs would be about $790 thousand.

A summary of incremental impacts (in excess of impacts of the typical SIP regulation) associated with Option I and Option II is shown in Table II for both small and large furnaces. Air impacts, expressed in Mg/year of particulate matter emissions reduced, would approximate the quantity of particulate matter collected and disposed of as solid waste.

Table II.—Summary of Incremental Impacts Associated With Regulatory Options

	Impacts			
	Air [1]	Water	Energy [2]	Economic [3]
I	122	None	~3.0	~0.6
II	101	None	~3.0	~0.5

[1] Mg/yr. reduced.
[2] Barrels of oil/day.
[3] Percent price increase.

Consideration of the beneficial impact on national particulate emissions, the lack of water pollution impact, the small potential for adverse solid waste impact, the reasonableness of energy and costs impacts, and the general availability of demonstrated emission control technology leads to the selection of Option I as the basis for standards for pressed and blown glass furnaces melting soda-lime formulations.

Pressed and Blown Glass—Other Than Soda-Lime Formulations

Uncontrolled particulate emissions from furnaces in this sector are about 5 g/kg (10 lb/ton) of glass pulled. Emission tests using EPA Method 5 on four furnaces melting borosilicate formulations and equipped with ESP's yielded a representative emission rate of about 0.50 g/kg (1.0 lb/ton) of glass pulled. A single emission test using EPA Method 5 on an ESP-controlled furnace melting fluoride/opal formulations yielded an emission rate of 0.17 g/kg (0.34 lb/ton) of glass pulled. EPA Method 5 tests of six ESP-controlled furnaces melting lead glass yielded a representative emission rate of 0.12 g/kg (0.24 lb/ton) of glass pulled. A single EPA method 5 emission test of an ESP-controlled furnace melting potash-soda-lead glass yielded an emission rate of 0.03 g/kg (0.06 lb/ton) of glass pulled. An EPA method 5 emission test on a furnace equipped with a fabric filter and melting soda-lead-borosilicate glass produced an emission rate of 0.17 g/kg (0.34 lb/ton) of glass pulled.

Upon consideration of the data cited above, an emission limit of 0.25 g/kg (0.5 lb/ton) of glass pulled was identified as a reasonable limit for control for pressed and blown glass furnaces melting other than soda-lime formulations. This limit was selected for Option I; it provides for about 95 percent particulate removal. Option II would set an emission limit of 0.5 g/kg (1.0 lb/ton) of glass pulled, which provides for a particulate removal of about 90 percent. Fabric filters and ESP's could be designed to achieve the levels of emission reduction required by either regulatory option.

By 1983 approximately 70 Gg/year (77,200 ton/year) of additional production is anticipated in this sector. One 45 Mg/day (50 ton/day) (small) furnace and two 90 Mg/day (100 ton/day) (large) furnaces would be built in order to provide this production. If uncontrolled, emissions from the one new small pressed and blown glass furnace melting formulations other than soda-lime would add about 90 Mg/year (100 ton/year) to national particulate emissions by 1983, while the emissions from the two new large furnaces would add about 260 Mg/year (287 ton/year) during the same period.

Compliance with a typical SIP regulation would reduce the impact from the small furnace to about 27 Mg/year (30 ton/year). Control to the Option I emissions limit would reduce the emissions to about 17 percent of those emitted under a typical SIP regulation. With Option II emissions would be reduced to about 33 percent of those emitted under a typical SIP regulation.

Compliance with a typical SIP regulation would reduce the impact of the large furnaces to about 47 Mg/year (52 ton/year). Under Option I, these emissions would be reduced to about 29 percent of those emitted under a typical SIP regulation. Under Option II, the large furnace emissions would be reduced to about 56 percent of those emitted under a typical SIP regulation.

The effect of a typical SIP regulation for both large and small furnaces would be a reduction of about 79 percent. Under Option I, emissions would be reduced to about 25 percent of those emitted under a typical SIP regulation. Under Option II, emissions would be reduced to about 50 percent of those emitted under a typical SIP regulation.

Ambient dispersion modeling indicates that under worst case conditions the annual maximum ground-level particulate concentration near an uncontrolled 45 Mg/day pressed and blown glass furnace melting formulations other than soda-lime would be less than 1 $\mu g/m^3$, as would be the concentrations resulting from compliance with a typical SIP regulation, Option I, or Option II. Corresponding annual maximum ground-level concentrations near a 90 Mg/day furnace also would be less than 1 $\mu g/m^3$.

The calculated maximum 24-hour ground-level concentration near an uncontrolled 45 Mg/day furnace in this sector would be 11 $\mu g/m^3$. This concentration would be reduced to 3 $\mu g/m^3$ with a typical SIP regulation. With Options I and II, the concentrations would be reduced to 1 $\mu g/m^3$ or less. The calculated maximum 24-hour ground-level concentration near an uncontrolled 90 Mg/day furnace would be 14 $\mu g/m^3$. This concentration would be reduced to 3 $\mu g/m^3$ with a typical SIP regulation and to below 1 $\mu g/m^3$ with Option I; with Option II it would reach 2 $\mu g/m^3$.

Since fabric filters and ESP's are likely to be the control systems installed on furnaces in this sector to comply with standards, there would be no water pollution impact associated with standards based on either Option I or Option II.

Under a typical SIP regulation, about 64 Mg/year (71 ton/year) of particulate matter would be collected from the one new 45 Mg/day furnace projected to come on-stream in the 1978–1983 period. Compliance with standards based on Option I and Option II would add about 23 Mg/year (25 ton/year) and 18 Mg/year (20 ton/year), respectively, to the solid waste collected under a typical SIP regulation. Option I would increase the mass of solids by about 36 percent over that resulting from compliance with a typical SIP regulation, and Option II would increase it by about 28 percent.

Under a typical SIP regulation, about 210 Mg/year (232 ton/year) of particulate matter would be collected from the *two* new 90 Mg/day furnaces projected to come on-stream in the 1978–1983 period. Compliance with standards based on Option I and Option II would add about 34 Mg/year (38 ton/year) and 21 Mg/year (23 ton/year), respectively, to the solid waste collected under a typical SIP regulation. Option I would increase the mass of solids by about 16 percent over that resulting from compliance with a typical SIP regulation, and Option II would increase it by about 10 percent. The total mass of solids for disposal collected from all three new furnaces in this sector, associated with Option I and Option II, would be about 57 Mg/year (63 ton/year) and about 39 Mg/year (43 ton/year), respectively.

The additional solid material collected under Option I or Option II would not differ chemically from the material collected under the typical SIP regulation. Collected solids either are recycled back into the glass melting process or are disposed of in a landfill. Recycling of the solids has no adverse environmental impact, and, since landfill operations are subject to State regulation, this disposal method also is not expected to have an adverse environmental impact.

Since ESP's have been the predominant control system used in the industry and are anticipated as the predominant system to be used for new plants coming on-stream between 1978–1983 regardless of which regulatory option is selected, energy requirements estimated for the typical SIP regulation, Option I, and Option II are based on the use of ESP's.

The energy required to control particulate emissions from the new 45 Mg/day pressed and blown glass furnace melting formulations other than soda-lime to the level required by the typical SIP regulation would be about 2.7 million kWh (1,500 barrels of oil/year). The energy required to comply with the Option I and Option II emissions limits would be essentially the same as that required for meeting a typical SIP regulation.

Control to the level required by a typical SIP regulation of the two new 90 Mg/day pressed and blown glass furnaces melting formulations other than soda-lime and projected to come on-stream during the 1978–1983 period would require about 6.6 million kWh (3,700 barrels of oil/year) if an ESP were used. The energy requirements to achieve the Option I and Option II emission limits would be essentially the same as the requirements for meeting a typical SIP regulation.

The energy required to comply with the emission limits of the regulatory options would be about [illegible] percent of total energy use for all new furnaces in this glass manufacturing sector. Considering the small amounts of additional oil and electricity required and the slight increase in total energy use in this sector, the energy impacts of either Option I or Option II would be negligible.

Incremental installed costs in January 1978 dollars associated with Option I for controlling particulate emissions from a 45 Mg/day pressed and blown glass furnace melting formulations other than soda-lime would be about $760 thousand for an ESP and about $[illegible] thousand for a fabric filter. Incremental installed costs associated with Option II would be about $[illegible] thousand for an ESP, and about $[illegible] thousand for a fabric filter. The incremental installed costs of control equipment associated with the Option I level of control would be about 2.4 times the incremental installed costs associated with Option II if ESP's were selected. If fabric filters were selected, the incremental installed costs associated with the Option I level of control would be about 1.2 times the incremental installed costs associated with Option II level of control.

Incremental annualized costs for a 45 Mg/day furnace associated with Option I would be about $[illegible] thousand/year and about $70 thousand/year for an ESP and a fabric filter, respectively. Incremental annualized costs associated with Option II would be about $[illegible] thousand/year for an ESP, and about $60 thousand/year for a fabric filter. The incremental annualized costs associated with Option I would be about [illegible] times the incremental annualized costs associated with Option II if ESP's were used. If fabric filters were used the incremental annualized costs associated with Option I would be about 1.2 times the incremental annualized costs associated with Option II.

Based on the use of control equipment with the highest annualized costs (worse case conditions), a price increase of about 0.4 percent would be necessary to offset the costs of installing control equipment on a 45 Mg/day pressed and blown glass furnace melting other than soda-lime formulations to meet the emission limits of Option I. A price increase of about 0.3 percent would be necessary to comply with the emission limits of Option II.

Incremental cumulative capital costs for the 1978–1983 period associated with Option I for the 45 Mg/day furnace would be about $235 thousand if an ESP were used. Use of an ESP to comply with Option II would require incremental cumulative capital costs of about $190 thousand for the same period. Fifth-year annualized costs for controlling this furnace in this sector to comply with Option I would be about $70 thousand. To comply with Option II, fifth-year annualized costs would be about $60 thousand.

Incremental installed costs in January 1978 dollars associated with Option I for controlling particulate emissions from a 90 Mg/day pressed and blown glass furnace melting other than soda-lime formulations would be about $800 thousand for an ESP and about $260 thousand for a fabric filter. Incremental installed costs associated with Option II would be about $140 thousand for an ESP, and about $180 thousand for a fabric filter. The incremental installed costs of control equipment associated with the Option I level of control would be about 5.7 times the incremental installed costs associated with Option II if ESP's were selected. If fabric filters were selected the incremental installed costs associated with the Option I level of control would be about 1.4 times the incremental installed costs associated with Option II.

Incremental annualized costs for a 90 Mg/day furnace associated with Option I would be about $245 thousand per year and about $85 thousand per year for an ESP and a fabric filter, respectively. Incremental annualized costs associated with Option II would be about $45 thousand per year for an ESP, and about $55 thousand per year for a fabric filter. The incremental annualized costs associated with Option I would be about 5.4 times the incremental annualized costs associated with Option II if ESP's were used. If fabric filters were used the incremental annualized costs associated with Option I would be about 1.5 times the incremental annualized costs associated with Option II.

Based on the use of control equipment with the highest annualized costs, a price increase of about 0.8 percent would be necessary to offset the costs of installing control equipment on the 90 Mg/day pressed and blown glass furnace melting formulations other than soda-lime to meet the emission limits of Option I. A price increase of about 0.5 percent would be necessary to comply with the emission limits of Option II.

Incremental cumulative capital costs for the 1978–1983 period associated with Option I for the two new 90 Mg/day furnaces would be about $500 thousand if fabric filters were used. Use of ESP's to comply with Option II would require incremental cumulative capital costs of about $300 thousand for the same period. Fifth-year annualized costs for controlling these glass melting furnaces to comply with Option I would be about $160 thousand. To comply with Option II, fifth-year annualized costs would be about $85 thousand.

A summary of incremental impacts (in excess of impacts of the typical SIP regulation) associated with Option I and Option II is shown in Table III for both small and large furnaces. Air impacts, expressed in Mg/year of particulate matter emissions reduced, would approximate the quantity of particulate matter collected and disposed of as solid waste.

Table III.—Summary of Incremental Impacts Associated With Regulatory Options

Regulatory option	Impacts: Air[1]	Water	Energy[2]	Economic[3]
I	57	None	Negligible	~0.7
II	89	None	Negligible	~0.4

[1] Mg/Yr. reduced.
[2] Barrels of oil/day.
[3] Percent price increase.

Consideration of the beneficial impact on national particulate emissions, lack of water pollution impact, the small potential for adverse solid waste impact, the lack of energy impact, the reasonableness of cost impacts, and the general availability of demonstrated emission control technology leads to the selection of Option I as the basis for standards for pressed and blown glass furnaces melting formulations other than soda-lime.

Wool Fiberglass

Uncontrolled particulate emissions from wool fiberglass furnaces are generally about 5 g/kg (10 lb/ton) of glass pulled. The average emission from three furnaces in the wool fiberglass sector equipped with ESP's was 0.18 g/kg (0.36 lb/ton) of glass pulled. EPA Method 5 tests of three furnaces equipped with fabric filters indicated emissions of 0.2 g/kg (0.4 lb/ton), 0.26 g/kg (0.52 lb/ton), and 0.55 g/kg (1.1 lb/ton) of glass pulled. The test data cited indicate that an emission limit of 0.2 g/kg (0.4 lb/ton) of glass pulled could be met through the use of an ESP and that a limit of 0.4 g/kg (0.8 lb/ton) of glass pulled could be met through the use of either an ESP or a fabric filter.

On the basis of these conclusions, two regulatory options for reducing particulate emissions from wool fiberglass furnaces were formulated: Option I would set an emission limit of 0.2 g/kg (0.4 lb/ton) of glass pulled, which would provide for about 95 percent particulate removal. Option II would set an emission limit of 0.4 g/kg (0.8 lb/ton) of glass pulled, which would provide for about 90 percent removal of particulates.

By 1983 approximately 360 Gg/year (397,000 ton/year) of additional production is anticipated in the wool fiberglass sector. About six new wool fiberglass furnaces of about 180 Mg/day (200 ton/day production capacity (the size of the model furnace) would be built in order to provide this additional production. If uncontrolled, these new wool fiberglass furnaces would add about 1,800 Mg/year (1,984 ton/year) to national particulate emissions by 1983. Compliance with a typical SIP regulation would reduce this impact to about 210 Mg/year (232 ton/year). Under Option I, emissions would be reduced to about 33 percent of those emitted under a typical SIP regulation. Under Option II, emissions would be reduced to about 66 percent of those emitted under a typical SIP regulation.

Ambient dispersion modeling indicates that under worst case conditions the annual maximum ground-level particulate concentration near an uncontrolled wool fiberglass furnace producing 180 Mg/day of glass would be about 2 $\mu g/m^3$. The annual maximum ground-level concentrations resulting from compliance with a typical SIP regulation, Option I, or Option II would be less than 1 $\mu g/m^3$. The calculated maximum 24-hour ground-level particulate concentration near an uncontrolled wool fiberglass furnace producing 180 Mg/day of glass would be about 29 $\mu g/m^3$. The corresponding concentration for complying with a typical SIP regulation would be about 3 $\mu g/m^3$. Under Option I, with an ESP employed for control, the maximum 24-

hour ground-level concentration would be reduced to 3 µg/m³. Under Option II it would be reduced to 5 and 4 µg/m³ with the fabric filter and ESP, respectively.

Since fabric filters and ESP's are likely to be the control systems installed on wool fiberglass furnaces to comply with standards, there would be no water pollution impact associated with standards based on either Option I or Option II.

Under a typical SIP regulation, about 1600 Mg/year (1,764 ton/year) of particulate matter would be collected from the six new 180 Mg/day wool fiberglass furnaces projected to come on-stream during the 1978–1983 period. Compliance with standards based on Option I and Option II would add about 140 Mg/year (154 ton/year) and about 70 Mg/year (77 ton/year), respectively, to the solid waste collected under a typical SIP regulation. Option I would increase the mass of solids for disposal by about 9 percent over that resulting from compliance with a typical SIP regulation, and Option II would increase it by about 4 percent. The additional solid material collected under Option I or Option II would not differ chemically from the material collected under a typical SIP regulation. Collected solids either are recycled back into the glass melting process or are disposed of in a landfill. Recycling of the solids has no adverse environmental impact, and, since landfill operations are subject to State regulation, this disposal method also is not expected to have an adverse environmental impact.

The estimated energy required to control particulate emissions from the six new wool fiberglass furnaces expected to come on-stream in the 1979–83 period to comply with a typical SIP regulation would be about [illegible] million kWh (2,650 barrels of oil/year) if electrostatic precipitators were used. Complying with the emission limits of Option I and Option II with electrostatic precipitators would require about 6.9 million kWh (2,900 barrels of oil/year). The energy required would be about 0.3 percent of the total energy use in the wool fiberglass sector. The energy impacts of either Option I or Option II would be negligible—only about 50 barrels of oil/year.

Incremental installed costs in January 1978 dollars associated with Option I for controlling particulate emissions from a 180 Mg/day wool fiberglass furnace would be about $500 thousand for an ESP and about $70 thousand for a fabric filter. Incremental installed costs associated with Option II would be about $110 thousand and about $30 thousand for an ESP and a fabric filter, respectively. The incremental installed costs of control equipment associated with the Option I level of control would be nearly 5 times the incremental installed costs associated with Option II if ESP's were selected. If fabric filters were selected, the incremental installed costs associated with the Option I level of control would be about twice the incremental installed costs associated with Option II.

Incremental annualized costs associated with Option I for a 180 Mg/day wool fiberglass furnace would be about $155 thousand/year and about $20 thousand/year for an ESP and a fabric filter, respectively. Incremental annualized costs associated with Option II would be about $35 thousand/year for an ESP and about $10 thousand/year for a fabric filter. The incremental annualized costs associated with Option I would be about five times the incremental annualized costs associated with Option II if ESP's were used. If fabric filters were used, the incremental annualized costs associated with Option I would be about two times the incremental annualized costs associated with Option II.

Based on the use of control equipment with the highest annualized costs (worst case conditions), a price increase of about 0.3 percent would be necessary to offset the costs of installing control equipment on a 180 Mg/day wool fiberglass furnace to meet the emission limits of Option I. A price increase of about 0.1 percent would be necessary to complying with the emission limits of Option II.

Incremental cumulative capital costs for the six new 180 Mg/day wool fiberglass furnaces during the 1979–1983 period associated with Option I would be about $3 million if ESP's were used. Use of fabric filters to comply with Option II would require incremental cumulative capital costs of about $185 thousand for the same period. Fifth-year annualized costs for controlling wool fiberglass furnaces complying with Option I would be about $930 thousand. To comply with Option II, fifth-year annualized costs would be about $60 thousand.

A summary of incremental impacts associated with Option I and Option II is shown in Table IV. Air impacts, expressed in Mg/year of particulate matter emissions reduced, would approximate the quantity of particulate matter collected and disposed of as solid waste.

Table IV.—Summary of Incremental Impacts Associated With Regulatory Options

	Impacts			
	Air[1]	Water	Energy[2]	Economic[3]
Regulatory option:				
I	140 Mg/yr		Negligible	0.3
II	70 Mg/yr		Negligible	0.1

[1] Mg/Yr. reduced.
[2] Barrels of oil/day.
[3] Percent price increase.

Consideration of the beneficial impact on national particulate emissions, the lack of water pollution impact, the small potential for adverse solid waste impact, the reasonableness of energy and cost impacts, and the general applicability of demonstrated emission control technology leads to the selection of Option I as the basis for standards for glass melting furnaces in the wool fiberglass sector.

Flat Glass

Uncontrolled particulate emissions from flat glass furnaces are about 1.5 g/kg (3.0 lb/ton) of glass pulled. There are no emissions test data for flat glass furnaces equipped with controls devices available for evaluation. However, the soda-lime formulations melted in these furnaces are quite similar to those melted in container glass furnaces, as are the chemical composition and physical characteristics of the particulate emissions. The primary difference between container glass and flat glass furnaces is that the uncontrolled emission rates of flat glass furnaces are greater. Given the similarity of processes, glass formulations, and emissions, it is expected that the percentage reduction in particulate emissions achieved by control of container glass furnaces also could be achieved with flat glass furnaces. This conclusion is supported by the performance guarantee underwritten by an ESP manufacturer for a flat glass facility which indicates at least 90 percent control efficiency. Thus, uncontrolled emissions from flat glass furnaces can be reduced with an ESP by at least 90 percent or to about 0.15 g/kg (0.3 lb/ton) of glass pulled.

The similarity of container glass and flat glass furnace formulations and emissions and the vendor guarantee noted above provide the basis for Option I. Option I would set an emission limit of 0.15 g/kg (0.3 lb/ton) of glass pulled, which would provide about 90 percent control. The Option II emission limit [illegible] in the other glass manufacturing sectors has been found to be twice the Option I limit. For consistency, therefore, Option II would set an emission limit of 0.3 g/kg (0.6 lb/ton) of glass pulled, which would provide about 80 percent control.

By 1983 approximately 240 Gg/year (264,555 ton/year) of additional production is expected in the flat glass sector. One new flat glass furnace of about 635 Mg/day (700 ton/day) capacity (the size of the model furnace) would be built in order to provide this additional production.

If uncontrolled, this new flat glass furnace would add about 360 Mg/year (397 ton/year) to national particulate emissions by 1983. Compliance with a typical SIP regulation would reduce this impact to about 90 Mg/year (100 ton/year). Under Option I, emissions would be reduced to about 40 percent of those emitted under a typical SIP regulation. Under Option II, emissions would be reduced to about 80 percent of those emitted under a typical SIP regulation.

Ambient dispersion modeling indicates that under worst case conditions the annual maximum ground-level particulate concentration near an uncontrolled flat glass furnace producing 635 Mg/day of glass would be about 1 $\mu g/m^3$. The annual maximum ground-level concentrations resulting from compliance with a typical SIP regulation, Option I, or Option II, would be less than 1 $\mu g/m^3$. The calculated maximum 24-hour ground-level particulate concentration near an uncontrolled flat glass furnace producing 635 Mg/day of glass would be about 21 $\mu g/m^3$. The corresponding concentration for complying with a typical SIP regulation would be about 5 $\mu g/m^3$. Under Option I, this concentration would be reduced to about 2 $\mu g/m^3$. Under Option II it would be reduced to about 5 $\mu g/m^3$.

Since the ESP is likely to be the emission control system installed on flat glass furnaces to comply with standards, there would be no water pollution impact associated with standards based on either Option I or Option II.

Under a typical SIP regulation, about 270 Mg/year (298 ton/year) of particulate matter would be collected from the one new 635 Mg/day flat glass furnace expected to come on-stream in the 1978–1983 period. Compliance with standards based on Option I and II would add about 50 Mg/year (55 ton/year) and about 20 Mg/year (22 ton/year), respectively, to the solid waste collected under a typical SIP regulation. Option I would increase the mass of solids for disposal by about 20 percent over that resulting from compliance with a typical SIP regulation, and Option II would increase it by about 7 percent.

The additional solid material collected under Option I or Option II would not differ chemically from the material collected under a typical SIP regulation. Collected solids either are recycled back into the glass melting process or are disposed of in a landfill. Recyling of the solids has no adverse environmental impact, and, since landfill operations are subject to State regulations, this disposal method also is not expected to have an adverse environmental impact.

Since the energy requirements for an electrostatic precipitator do not vary significantly over the range of emission reductions considered here, the estimate of energy required to control particulate emissions from the one new flat glass furnace would be about the same for compliance with a typical SIP regulation, Option I or Option II—about 7.6 million kWh (4,300 barrels of oil/year). The energy required to comply with the emission limits of the regulatory options would be about 0.2 percent of the total energy use in the flat glass sector. There would be no incremental energy impact associated with either Option I or Option II as compared with a typical SIP regulation.

The incremental installed cost in January 1978 dollars associated with Option I for controlling particulate emissions from a 635 Mg/day flat glass furnace would be about $600 thousand. Incremental installed cost associated with Option II would be about $140 thousand. The incremental installed cost of control equipment associated with the Option I level of control would be somewhat more than four times the incremental installed cost associated with the Option II level of control.

Incremental annualized cost associated with Option I for a 635 Mg/day flat glass furnace would be about $190 thousand/year; the corresponding incremental annualized cost for Option II would be about $45 thousand/year. The incremental annualized cost associated with Option I would be more than four times the incremental annualized cost associated with Option II.

A price increase of about 0.4 percent would be necessary to offset the cost of installing an ESP on a 635 Mg/day flat glass furnace to meet the emission limit of Option I. A price increase of about 0.1 percent would be necessary to comply with the emission limit of Option II.

Incremental cumulative capital cost for the one new 635 Mg/day flat glass furnace during the 1978–1983 period associated with Option I would be about $605 thousand. Compliance with Option II would require an incremental cumulative capital cost of about $145 thousand for the same period. Fifth-year annualized costs for controlling the one new flat glass furnace to comply with Option I would be about $190 thousand. To meet the Option II emission limit, fifth-year annualized costs would be about $45 thousand.

A summary of incremental impacts associated with Option I and Option II is shown in Table V. Air impacts, expressed in Mg/year of particulate matter emissions reduced, would approximate the quantity of particulate matter collected and disposed of as solid waste.

Table V.—Summary of Incremental Impacts Associated With Regulatory Options

	Impacts			
	Air[1]	Water	Energy[2]	Economic[3]
Regulatory option:				
I	55	None	Negligible	0.4
II	20	None	Negligible	0.1

[1] Mg/Yr. reduced.
[2] Barrels of oil/day.
[3] Percent price increase.

Consideration of the beneficial impact on national particulate emissions, the lack of water pollution impact, the small potential for adverse solid waste impact, the lack of energy impact, the reasonableness of cost impacts, and the general availability of demonstrated emission control technology leads to the selection of the Option I as the basis for standards for glass melting furnaces in the flat glass sector.

Summary

If uncontrolled, total particulate emissions from the 45 new glass melting furnaces projected to come on-stream between 1978 and 1983 would be about 5,200 Mg/year (5,732 ton/year). Compared to a typical SIP regulation, Option I would reduce particulate emissions by an additional 1,100 Mg/year (1,213 ton/year).

Ambient dispersion modeling indicates that the annual maximum ground-level particulate concentrations near uncontrolled glass melting furnaces would be 2 $\mu g/m^3$ or less. Both a typical SIP regulation and the Option I emission limits would reduce the annual maximum ground-level particulate concentrations to under 1 $\mu g/m^3$. The 24-hour maximum ground-level particulate concentrations near uncontrolled glass melting furnaces would be less than 50 $\mu g/m^3$, with a median concentration of about 20 $\mu g/m^3$. Under a typical SIP regulation these concentrations would be reduced to 5 $\mu g/m^3$ or less. Control to the Option I emission limits would reduce the 24-hour maximum ground-level concentrations near glass melting furnaces to about 2 μg/m³ or less.

The glass manufacturing process has minimal water pollution potential. Complying with a standard based on Option I would have a negligible water pollution impact, because control systems installed to meet Option I would not discharge waste water streams.

The amounts of solid waste generated in the control of particulates from glass melting furnaces would approximate the amount of particulate removed from exhaust gases. Compliance with a typical SIP regulation would produce 3,700 Mg (4,080 tons) of solid waste per year. Meeting the Option I emission limits would generate an additional 1,100 Mg/year (1,213 ton/year). Either recycling or landfilling would present minimal adverse environmental impact. Totally recycling the collected solids would have no adverse impact. Landfilling operations must meet State regulations, and therefore this disposal method would have limited potential for adverse environmental impact.

Implementing Option I would require about 1.6 million kWh of electricity to power the emission control equipment installed above the requirements for implementing a typical SIP regulation. To meet this power requirement electric utilities would require about 990 barrels of oil/year, or about 3 barrels/day. The energy that would be required to operate emission reduction sytems to meet a standard based on the Option I limits would be 2 percent or less of the total energy used in glass production.

Incremental cumulative capital costs to the glass manufacturing industry for controlling emissions from new glass melting furnaces projected to come on-stream during the 1979–1984 period to comply with a standard based on the Option I emission limits would be about $27.9 million. The fifth-year annualized costs to the glass manufacturing industry associated with compliance with the Option I emission limits would be about $8.4 million. An industry-wide price increase of about 0.7 percent would be necessary to offset the costs of installing control equipment to meet the emission limits of Option I.

Modification, Reconstruction, and Other Considerations

An exemption from provisions of the modification section (40 CFR § 60.14) is proposed for those plants which convert to fuel-oil firing, even though particulate emissions would more than likely be increased. The primary objective of the proposed standards is to control emissions of particulates from glass melting furnaces. The data and information supporting the standards consider essentially only those emissions arising from the basic melting process, not those arising from fuel combustion. It is not the prime purpose of these standards, therefore, to control emissions from fuel combustion per se. Consequently, since emissions from fuel combustion are small in comparison with those from the basic melting process, and a conversion of glass melting furnaces to firing oil rather than natural gas will aid in efforts to conserve natural gas resources, the standards proposed herein include a provision exempting fuel switching in glass melting furnaces from consideration as a modification. The proposed increment in emissions allowed fuel oil-fired glass melting furnaces is 15 percent, a small allowance; however, without this exemption there would be a large economic impact on the industry.

An exemption from reconstruction provisions (40 CFR § 60.15) is proposed for the cold refining (rebricking) of the melter of an existing furnace. Under 40 CFR § 60.15 the Administrator must be notified of intent to conduct such a procedure 60 days in advance of commencement, and will determine whether or not the rebricking constitutes a reconstruction. This rebricking procedure has been a routine operation in the glass manufacturing industry and would not generally be considered an opportunity to evade the provisions of the standard by unduly extending the useful life of an existing glass melting furnace. Therefore, the exemption of rebricking from reconstruction provision has been proposed.

Glass melting furnaces fired with number 2 fuel oil would be expected to exhibit a 10 percent increase in particulate emissions over those produced in gas-fired furnaces since particulates are formed by the combustion of oil. Similarly, furnaces fired with numer 4, 5, or 6 fuel oil would show a 15 percent increase in particulate emissions over those produced in gas-fired furnaces. This effect of fuel oil on furnace emissions being recognized, it is proposed that the emission limits for furnaces fired with fuel oil be the limits for gas-fired furnaces multiplied by 1.15. It is additionally proposed that simultaneously liquid and gas-fired furnaces have emission limits based on an equation, taking into consideraton the relative proportions of the fuels being fired.

Selection of Performance Test Methods

The use of EPA Reference Method 5—"Determination of Particulate Emissions from Stationary Sources" (Appendix A, 40 CFR § 60, Federal Register, December 23, 1971) is required to determine compliance with the mass standards for particular matter emissions. Emission test data used in the development of the proposed standard were obtained either by the LAAPCD sampling method or by EPA Method 5. However, results of performance tests using Method 5 conducted by EPA on existing glass melting furnaces comprise a major portion of the data base used in the development of the proposed standard. EPA Reference Method 5 has been shown to provide a representative measurement of particulate matter emissions. Therefore, it has been included for determining compliance with the proposed standards.

Calculations applicable under Method 5 necessitate the use of data obtained from three other EPA test methods conducted previous to the performance of Method 5. Method 1—"Sample and Velocity Traverse for Stationary Sources" must be conducted in order to obtain representative measurements of pollutant emissions. The average gas velocity in the exhaust stack is measured by conducting Method 2—"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)." The analysis of gas composition is measured by conducting Method 3—"Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight." These three tests provide data necessary in Method 5 for converting volumetric flow rate to mass flow rate. In addition, Method 4—"Determination of Moisture Content in Stack Gases" is suggested as an accurate mode of predetermination of moisture content.

Since the proposed standards are expressed as mass of emissions per unit mass of glass pulled, it will be neccessary to quantify glass pulled in addition to measuring particulate emissions. Glass production in Mg shall be determined by direct measurement or computed from materials balance data using good engineering practice. The materials balance computation may consist of a process relationship between feed material input rate and the glass pull rate. In all materials balance computations, glass pulled from the furnace shall include product, cullet, and any waste glass. The hourly glass pull rate for a furnace shall be determined by averaging the glass pull rate over the time of the performance test.

Selection of Monitoring Requirements

To provide a convenient means for enforcement personnel to ensure that installed emission control systems comply with standards of performance through proper operation and maintenance, monitoring requirements are generally included in standards of performance. For glass melting furnaces the most straightforward means of ensuring proper operation and maintenance is to monitor emissions released to the atmosphere. EPA has established opacity monitoring performance specifications in Appendix B of 40 CFR § 60 for industrial sources with well-developed velocity and temperature profiles.

The best indirect method of monitoring proper operation and maintenance of compliance control equipment is the determination of exhaust gas opacity limits. Determining an acceptable exhaust gas opacity limit is not presently possible because the relationship between particulate emissions and corresponding opacity levels was not evaluated for glass melting furnaces. The data base for the particulate standards does not include information on opacity. Also, currently there are no continuous particulate monitors operating on glass melting furnaces; consquently, the data base necessary for developing an opacity-emission rate relationship is not available. Resolution of the sampling problems, development of performance standards for continuous particulate monitors, and obtaining a data base for developing an opacity-emission rate relationship would entail a major development program. For these reasons, continuous monitoring of particulate emissions from glass melting furnaces would not be required by the proposed standards.

Public Hearing

A public hearing will be held to discuss these proposed standards in accordance with Section 307(d)(5) of the Clean Air Act. Persons wishing to make oral presentations should contact EPA at the address given in the ADDRESSES section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement with EPA before, during, or within 30 days after the hearing. Written statements should be addressed to the Docket address given in the ADDRESSES section of this preamble.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Central Docket Section in Washington, D.C. (See ADDRESSES section of this preamble).

Miscellaneous

The docket is an organized and complete file of all the information considered by EPA in the development of this rulemaking. The principal purposes of the docket are (1) to allow interested persons to identify and locate documents so that they can intelligently and effectively participate in the rulemaking process, and (2) to serve as the record for judicial review. The docket requirement is discussed in Section 307(d) of the Clean Air Act.

As prescribed by Section 111 of the Act, this proposal of standards has been preceded by the Administrator's determination that emissions from glass manufacturing plants contribute to the endangerment of public health or welfare, and by publication of this determination in this issue of the **Federal Register**. In accordance with Section 117 of the Act, publication of these proposed standards was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies. The Administrator will welcome comments on all aspects of the proposed regulation, including the designation of glass manufacturing plants as a significant contributor to air pollution which causes or contributes to the endangerment of public health or welfare, economic and technological issues, and on the proposed test method.

It should be noted that standards of performance for new sources established under Section 111 of the Clean Air Act reflect:

"Application of the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated." [Section 111(a)(1)]

Although there may be emission control technology available that is capable of reducing emissions below those levels required to comply with the standards of performance, this technology might not be selected as the basis of standards of performance because of costs associated with its use. Accordingly, these standards of performance should not be viewed as the ultimate in achievable emissions control. In fact, the Act requires (or has the potential for requiring) the imposition of a more stringent emission standard in several situations. For example, applicable costs do not necessarily play as prominent a role in determining the "lowest achievable emission rate" for new or modified sources locating in nonattainment areas; i.e., those areas where statutorily-mandated health and welfare standards are being violated. In this respect, Section 173 of the Act requires that new or modified sources constructed in an area which is in violation of the NAAQS must reduce emissions to the level which reflects the "lowest achievable emission rate" (LAER), as defined in Section 171(3), for such category of source. The statute defines LAER as that rate of emissions which reflects:

"(A) the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or (B) the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent."

In no event can the emission rate exceed any applicable new source performance standard [Section 171(3)].

A similar situation may arise under the prevention of significant deterioration of air quality provisions of the Act (Part C). These provisions require that certain sources (referred to in Section 169(1)) employ "best available control technology" (as defined in Section 169(3)) for all pollutants regulated under the Act. Best available control technology (BACT) must be determined on a case-by-case basis, taking energy, environmental, and economic impacts and other costs into account. In no event may the application of BACT result in emissions of any pollutants which will exceed the emissions allowed by an applicable standard established pursuant to Section 111 (or 112) of the Act.

In all events, State Implementation Plans approved or promulgated under Section 110 of the Act must provide for the attainment and maintenance of national ambient air quality standards (NAAQS) designed to protect public health and welfare. For this purpose, SIP's must in some cases require greater emission reductions than those required by standards of performance for new sources.

Finally, States are free under Section 116 of the Act to establish even more stringent limits than those established under Section 111 or those necessary to attain or maintain the NAAQS under Section 110. Accordingly, new sources may in some cases be subject to limitations more stringent than EPA's standards of performance under Section

111, and prospective owners and operators of new sources should be aware of this possibility in planning for such facilities.

EPA will review this regulation four years from the date of promulgation. This review will include an assessment of such factors as the need for integration with other programs, the existence of alternative methods, enforceability, and improvements in emission control technology.

An economic impact assignment has been prepared as required under Section 317 of the Act and is included in the Background Information Document.

Dated: May 22, 1979.

Douglas M. Costle,

Administrator.

It is proposed to amend Part 60 of Chapter I, Title 40 of the Code of Federal Regulations as follows:

Subpart CC—Standards of Performance for Glass Manufacturing Plants

Sec.

60.290 Applicability and designation of affected facility.

60.291 Definitions.

60.292 Standards for particulate matter.

60.293 Test methods and procedures.

Authority: Sections 111 and 301(a) of the Clean Air Act, as amended [42 U.S.C. 7411, 7601(a)], and additional authority as noted below.

§ 60.290 Applicability and designation of affected facility.

The affected facility to which the provisions of this subpart apply is each glass melting furnace within a glass manufacturing plant.

§ 60.291 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A.

(a) "Glass manufacturing plant" means any plant which produces glass or glass products.

(b) "Glass melting furnace" means a unit comprising a refractory vessel in which raw materials are charged, melted at high temperature, refined, and conditioned to produce molten glass. The unit includes foundations, superstructure and retaining walls, raw material charger systems, heat exchangers, melter cooling system, exhaust system, refractory brick work, fuel supply and electrical boosting equipment, integral control systems and instrumentation, and appendages for conditioning and distributing molten glass to forming apparatuses.

(c) "Day pot" means any glass melting furnace designed to produce less than 1800 kilograms of glass per day.

(d) "All-electric melter" means a glass melting furnace in which all the heat required for melting is provided by electric current from electrodes submerged in the molten glass, although some fossil fuel may be charged to the furnace as raw material.

(e) "Glass" means flat glass; container glass; pressed and blown glass; and wool fiberglass.

(f) "Flat glass" means glass made of soda-lime recipe and produced into continuous flat sheets and other products listed in Standard Industrial Classification 3211 (SIC 3211).

(g) "Container glass" means glass made of soda-lime recipe, clear or colored, which is pressed and/or blown into bottles, jars, ampoules, and other products listed in SIC 3211.

(h) "Pressed and blown glass" means glass which is pressed and/or blown, including textile fiberglass, noncontinuous process flat glass, noncontainer glass, and other products listed in SIC 3229. It is separated into:

(1) Glass of soda-lime recipe; and

(2) Glass of borosilicate, opal, lead and other recipes.

(i) "Wool fiberglass" means fibrous glass of random texture, including fiberglass insulation, and other products listed in SIC 3296.

(j) "Recipe" means formulation of raw materials.

(k) "Glass production" means the weight of glass pulled from a glass melting furnace.

(l) "Rebricking" means cold replacement of damaged or worn refractory parts of the glass melting furnace. Rebricking includes replacement of the refractories comprising the bottom, sidewalls, or roof of the melting vessel; replacement of refractory work in the heat exchanger; replacement of refractory portions of the glass conditioning and distribution system.

(m) "Soda-lime recipe" means raw material formulation of the following approximate proportions: 72 percent silica; 15 percent soda; 10 percent lime and magnesia; 2 percent alumina; and 1 percent miscellaneous materials.

§ 60.292 Standards for particulate matter.

(a) On or after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator of a glass melting furnace subject to the provisions of this subpart shall cause to be discharged into the atmosphere, except as provided in paragraph (d) of this section:

(1) From any glass melting furnace, fired with a gaseous fuel, particulate matter at emission rates exceeding those specified in Table CC-1.

(2) From any glass melting furnace, fired with a liquid fuel, particulate matter at emission rates exceeding 1.15 times those specified in Table CC-1.

(3) From any glass melting furnace, simultaneously fired with gaseous and liquid fuel, particulate matter at emission rates exceeding those specified by the following equation:

$$STD = X[1.15\ (Y) + (Z)]$$

where:

STD = Particulate matter emission limit

X = Emission rate specified in Table CC-1

Y = Decimal percent of liquid fuel heating value to total (gaseous and liquid) fuel heating value

kilojoules

kilojoules

Z = (1 − Y)

(b) Conversion of a glass melting furnace to use of liquid fuel shall not be considered a modification for purposes of 40 CFR 60.14.

(c) Rebricking and the cost of rebricking shall not be considered reconstruction for the purposes of 40 CFR 60.15.

(d) This subpart shall not apply to day pots and all-electric melters.

Table CC-1—*Emission Rates*

Glass category	g of particulate/kg of glass produced
(1) Flat Glass	0.15
(2) Container Glass	.10
(3) Pressed and Blown Glass:	
(a) Other than soda-lime recipes (i.e., borosilicate, opal, lead and other recipes, including textile fiberglass)	.25
(b) Soda-lime recipes	.10
(4) Wool Fiberglass	.20

§ 60.293 Test methods and procedures.

(a) Reference methods in Appendix A of this part, except as provided under § 60.8(b), shall be used to determine compliance with § 60.292 as follows:

(1) Method 5 shall be used to determine the concentration of particulate matter and the associated moisture content.

(2) Method 1 shall be used for sample and velocity traverses, and

(3) Method 2 shall be used to determine velocity and volumetric flow rate.

(4) Method 3 shall be used for gas analysis.

(b) For Method 5, the sample probe and filter holder shall be heated to 121 °C (250°F). The sampling time for each run shall be at least 60 minutes and the volume shall be at least 4.25 dscm.

(c) The particulate emission rate, E, shall be computed as follows:

$E = V \times C$

where:

(1) E is the particulate emission rate (g/hr).

(2) V is the average volumetric flow rate (dscm/hr) as found from Method 2; and

(3) C is the average concentration (g/dscm) of particulate matter as found from Method 5.

(d) the rate of glass production, P (kg/hr) shall be determined by dividing the weight of glass pulled in kilograms (kg) from the affected facility during the performance test by the number of hours (hr) taken to perform the performance test. The glass pulled in kilograms shall be determined by direct measurement or computed from materials balance by good engineering practice.

(e) The furnace emission rate shall be computed as follows:

$R = E/P$

where:

(1) R is the furnace emission rate (g/kg);

(2) E is the particulate emission rate (g/hr) from (c) above; and

(3) P is the rate of glass production (kg/hr) from (d) above.

[Sec. 114 of Clean Air Act as amended (42 U.S.C. 7414).]

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