

RULE 4354 GLASS MELTING FURNACES (Adopted September 14, 1994; Amended April 16, 1998; Amended February 21, 2002, Amended August 17, 2006, Amended October 16, 2008, Amended September 16, 2010; Amended May 19, 2011)

1.0 Purpose

The purpose of this rule is to limit emissions of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), oxides of sulfur (SO_x), and particulate matter (PM₁₀) from glass melting furnaces.

2.0 Applicability

The provisions of this rule shall apply to any glass melting furnace.

3.0 Definitions

3.1 Air-fuel Firing: operation of a glass melting furnace where greater than 50% of the oxidant for the fuel comes from ambient air. 100% air-fuel fired means operation of a glass melting furnace where the oxidant is exclusively ambient air.

3.2 Air Pollution Control Officer (APCO): as defined in Rule 1020 (Definitions).

3.3 Block 24-hour Average: the arithmetic average of the hourly emission rates of a furnace as measured over 24 one-hour periods, daily, from 12:00 AM to 11:59 PM, excluding periods of system calibration.

3.4 California Air Resources Board (ARB): as defined in Rule 1020 (Definitions).

3.5 Carbon Monoxide (CO): emissions of carbon monoxide, a colorless and odorless gas resulting from incomplete combustion of fuel.

3.6 Commercial Propane: a gaseous fuel composed primarily of propane.

3.7 Condensable PM₁₀: PM₁₀ that is vapor phase at stack conditions, but which condenses or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack.

3.8 Container Glass: any glass manufactured by pressing, blowing in molds, drawing, rolling, or casting which is used as a container.

3.9 Continuous Emissions Monitoring System (CEMS): continuous emissions monitoring system.

3.10 Dry Standard Cubic Foot or Feet (Dscf): dry gas volume corrected to standard conditions.

- 3.11 Environmental Protection Agency (EPA): United States Environmental Protection Agency, or any person designated to act on its behalf.
- 3.12 Fiberglass: material consisting of fine filaments of glass that are combined in yarn and woven or spun into fabrics, or that are used as reinforcement in other materials or in masses as thermal or as acoustical insulating products for the construction industry.
- 3.13 Filterable PM10: PM10 that is directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
- 3.14 Flat glass: any glass produced by the float, sheet, rolled, or plate glass process which is used in windows, windshields, tabletops, or similar products.
- 3.15 Furnace Battery: two or more glass melting furnaces that exhaust to a common stack.
- 3.16 Furnace Rebuild: a cold tank repair which is commenced after the end of a furnace campaign period or expected life cycle of a furnace.
- 3.17 Idling: the operation of a furnace at less than 25 percent of the permitted glass production capacity or fuel use capacity as stated on the Permit to Operate (PTO).
- 3.18 Key System Operating Parameter: a parameter used to ensure compliance with an emission limit. A key system operating parameter may be any operating parameter that would affect the emissions performance of the particular equipment unit to which the emission limit applies. Examples include, but are not limited to, temperature, pressure drop, airflow rate, or electrostatic precipitator voltage.
- 3.19 Liquefied Petroleum Gas (LPG): LPG is a general term for the following gases: commercial propane, commercial butane, propane-butane (PB) mixtures, and special duty propane, although some people consider commercial propane separate from LPG.
- 3.20 Multiple Furnaces: two or more glass melting furnaces at a single facility that do not exhaust to a common stack.
- 3.21 Normal Business Hours: Monday through Friday, 8:00 am to 5:00 pm.
- 3.22 Oxidant: a substance that oxidizes another substance or an oxidizing agent.
- 3.23 Oxides of Nitrogen (NO_x): the sum of oxides of nitrogen in the flue gas, collectively expressed as nitrogen dioxide (NO₂).

- 3.24 Oxides of Sulfur (SO_x): the sum of compounds containing sulfur and oxygen, such as sulfur dioxide (SO₂) and sulfur trioxide (SO₃).
- 3.25 Oxygen-Assisted Combustion: operation of a glass melting furnace where the oxidant is greater than the oxygen content in ambient air or greater than 20.9 percent oxygen.
- 3.26 Oxy-fuel Fired: operation of a glass melting furnace where greater than 50% of the oxidant for the fuel is provided from enriched oxygen streams.
- 3.27 Parts Per Million by Volume (ppmv): the ratio of the number of gas molecules of a given species or group of species, to the number of millions of a total gas molecules.
- 3.28 Parts Per Million by Weight (ppm): the ratio of the weight of the given species or group of species, to the weight of total mixture and the ratio multiplied by one million.
- 3.29 Permitted Glass Production Capacity: the maximum pull rate as stated in the Permit to Operate (PTO).
- 3.30 PM₁₀: as defined in Rule 1020 (Definitions).
- 3.31 Potential to Emit: as defined in Rule 2201 (New and Modified Stationary Source Review Rule).
- 3.32 Primary Furnace Combustion System: the burners in a furnace that are used during production of glass.
- 3.33 Permit-to Operate (PTO): a Permit To Operate issued by the District.
- 3.34 PUC-quality Natural Gas: a gaseous fuel that meets the requirements specified in California Public Utilities Commission (PUC) General Order 58-A. PUC-quality natural gas also means that the sulfur content is no more than one-fourth (0.25) grain of hydrogen sulfide per one hundred (100) standard cubic feet and no more than five (5) grains of total sulfur per one hundred (100) standard cubic feet.
- 3.35 Rate: the amount of glass coming out of a glass melting furnace, expressed in short tons per day.
- 3.36 Rolling Average: the arithmetic average of the emission rates of a furnace over a contiguous period, excluding periods of system calibration.
- 3.36.1 For rolling 30-day averages, the averaged emissions are daily emissions and the contiguous period is 30 days.

3.36.2 For rolling 24-hour averages, the averaged emissions are hourly emissions and the contiguous period is 24 hours.

3.36.3 For rolling three hour averages, the averaged emissions are hourly emissions and the contiguous period is three hours.

3.37 Shutdown: the period of time during which a glass-melting furnace is taken from an operational to a non-operational status by allowing it to cool down from its operating temperature to a cold or ambient temperature as the fuel supply is turned off.

3.38 Standard Conditions: as defined in Rule 1020 (Definitions).

3.39 Start-up: the period of time, after initial construction or a furnace rebuild, during which a glass melting furnace is heated to operating temperature by the primary furnace combustion system, and systems and instrumentation are brought to stabilization.

3.40 Stationary Source: as defined in Rule 2201 (New and Modified Stationary Source Review Rule).

3.41 Volatile Organic Compound (VOC): as defined in Rule 1020 (Definitions).

4.0 Exemptions

4.1 Except for Section 6.8, the provisions of this rule shall not apply to electric glass melting furnaces where all the heat is supplied by an electric current from electrodes submerged in the molten glass, except that heat may be supplied by other fuels for start-up when the furnace contains no molten glass.

4.2 Except for Section 6.8, the provisions of this rule shall not apply to any glass melting furnace that is part of a stationary source with a total potential to emit, for all processes, less than ten (10.0) tons per year of NO_x and less than ten (10.0) tons per year of VOC.

4.3 Except for Section 6.8, the emission limits of Sections 5.3 and 5.4 and the monitoring requirements of Sections 5.9.3 and 5.9.4 shall not apply to a glass melting furnace that meets all of the following conditions:

4.3.1 The furnace has permitted glass production capacity less than five (5) tons per day;

4.3.2 The actual total NO_x emissions for the facility are less than eight (8) tons per year; and

4.3.3 The actual total VOC emissions for the facility are less than eight (8) tons per year.

4.4 The emission limits in Tables 1 through 4 shall not apply during periods of start-up, shutdown, or idling, provided the operator complies with the applicable requirements of Sections 5.5, 5.6, 5.7 and 6.7.

5.0 Requirements

5.1 NOx Emission Limits

5.1.1 Except as specified in Section 4.4, the operator of any glass melting furnace shall not operate a furnace in such a manner that results in NOx emissions exceeding the limits in Table 1. The deadlines to comply with the emission limits are specified in Section 7.0.

Table 1 – NOx Emission Limits in pounds NOx per ton glass produced			
Type of Glass Produced	Tier 2 NOx limit	Tier 3 NOx limit	Tier 4 NOx limit
Container Glass	4.0 ^A	1.5 ^B	not available
Fiberglass	4.0 ^A	1.3 ^{A, C} 3.0 ^{A, D}	not available
Flat Glass Standard Option	9.2 ^A 7.0 ^B	5.5 ^A 5.0 ^B	3.7 ^A 3.2 ^B
Flat Glass Enhanced Option	9.2 ^A 7.0 ^B	5.5 ^A 5.0 ^B	3.4 ^A 2.9 ^B
Flat Glass Early Enhanced Option	9.2 ^A 7.0 ^B	not available	3.4 ^A 2.9 ^B

^A Block 24-hour average

^B Rolling 30-day average

^C Not subject to California Public Resources Code Section 19511

^D Subject to California Public Resources Code Section 19511

5.1.2 Instead of each furnace individually meeting the applicable Table 1 Tier 2 NOx limit, an operator may choose to meet the Tier 2 NOx limit for multiple furnaces or furnace batteries by considering the multiple furnaces or furnace battery as a single unit. An operator choosing this option shall conform to the provisions of Sections 9.1 through 9.6.2 for Tier 2 NOx.

5.1.3 Instead of each furnace individually meeting the applicable Table 1 Tier 3 NOx limit, an operator of multiple furnaces or a furnace battery may choose to meet the applicable emission limit by considering the multiple furnaces or furnace battery as a single unit. An operator choosing this

option shall conform to the provisions of Sections 9.6 through 9.7.8.5 for Tier 3 NOx.

5.1.4 A flat glass operator who commits to meet the Table 1 Tier 4 early enhanced option NOx limits shall comply with the limits according to the deadlines specified in Section 7.2.2. After January 1, 2011, an operator who commits to meet the early enhanced NOx limits schedule is not eligible to choose a different compliance option and applicable deadlines.

5.2 CO and VOC Emission Limits

5.2.1 Except as specified in Section 4.4, the operator of any glass melting furnace shall not operate a furnace in such a manner that results in CO or VOC emissions exceeding the limits in Table 2.

Table 2 - CO and VOC Emission Limits – rolling three hour average (ppmv limits are referenced at 8% O ₂ and dry stack conditions)			
Type of Glass Produced	Firing Technology	CO Limit	VOC Limit
Container Glass or Fiberglass	100% air fired furnace	300 ppmv	20 ppmv
	Oxygen-assisted or Oxy-fuel furnace	1.0 lb/ton glass produced	0.25 lb/ton glass produced
Flat Glass	100% air fired furnace	300 ppmv	20 ppmv
	Oxygen-assisted or Oxy-fuel furnace	0.9 lb/ton glass produced	0.10 lb/ton glass produced

5.2.2 On and after January 1, 2009, instead of each furnace individually meeting the applicable CO or VOC or both emission limit in Table 2, an operator may choose to meet the CO or VOC or both emission limit for multiple furnaces or furnace batteries by considering the multiple furnaces or furnace battery as a single unit. An operator choosing this option shall conform to the provisions of Sections 9.6 through 9.7.8.5 for CO emissions or VOC emissions or both.

5.3 SOx Emission Limits

5.3.1 Effective through December 31, 2010, in order to limit SOx emissions, all glass melting furnaces subject to Table 1 emission limits shall fire on PUC-quality natural gas, commercial propane, or LPG on and after March 31, 2008. Liquid fuel may be used as backup fuel or standby fuel provided the liquid fuel contains no more than 15 ppm of sulfur and the furnace exhaust is controlled by a SOx emission control system with control system efficiency of 50% or greater. If a furnace meets the applicable Table 3 SOx limit while firing on backup fuel or standby fuel,

the 50% SOx emission control system efficiency requirement shall not apply.

5.3.2 Effective on and after January 1, 2011, except as specified in Section 4.4 and Section 5.3.3, each furnace shall meet the applicable SOx emission limit from Table 3.

Type of Glass Produced	Firing Technology	SOx Limit
Container Glass	Oxy-fuel furnaces and $\geq 25.0\%$ of total cullet is mixed color cullet	1.1 ^B
	All other container glass furnaces	0.90 ^B
Fiberglass	All technologies	0.90 ^C
Flat Glass	All technologies	1.7 ^A
		1.2 ^B

^A Block 24-hour average

^B Rolling 30-day average

^C Rolling 24-hour average

5.3.3 Effective January 1, 2011 and ending on the compliance date detailed in Section 7.2.2, a flat glass furnace operator electing the Tier 4 early enhanced option shall fire on PUC-quality natural gas, commercial propane, or LPG. Liquid fuel may be used as backup fuel or standby fuel provided the liquid fuel contains no more than 15 ppm of sulfur and the furnace exhaust is controlled by a SOx emission control system with control system efficiency of 50% or greater. If a furnace meets the applicable Table 3 SOx limit while firing on backup fuel or standby fuel, the 50% SOx emission control system efficiency requirement shall not apply. On and after the compliance date in Section 7.2.2, a flat glass furnace operator electing the Tier 4 early enhanced option shall be subject to the flat glass SOx emission limit in Table 3.

5.3.4 The amount of mixed color cullet used shall be determined as a rolling 30-day average.

5.3.5 Instead of each furnace individually meeting the applicable SOx limit in Table 3, an operator may choose to meet the SOx limit for multiple furnaces or furnace batteries by considering the multiple furnaces or furnace battery as a single unit. An operator choosing this option shall conform to the provisions of Sections 9.6 through 9.7.8.5 for SOx emissions.

5.4 PM10 Emission Limits

5.4.1 Except as specified in Section 4.4, the operator of any glass melting furnace shall not operate a furnace in such a manner that results in PM10 emissions exceeding the applicable limits in Table 4, where total PM10 includes both filterable PM10 and condensable PM10. The deadlines to comply with the PM10 emission limits are specified in Section 7.0.

Table 4 - PM10 Emission Limits in pounds total PM10 per ton glass produced Block 24-hour average		
Type of Glass Produced	Firing Technology	PM10 Limit
Container Glass	All technologies	0.50
Fiberglass	All technologies	0.50
Flat Glass	All technologies	0.70

5.4.2 Instead of each furnace individually meeting the applicable PM10 limit in Table 4, an operator may choose to meet the PM10 limit for multiple furnaces or furnace batteries by considering the multiple furnaces or furnace battery as a single unit. An operator choosing this option shall conform to the provisions of Sections 9.6 through 9.7.8.5 for PM10 emissions.

5.5 Start-up Requirements

5.5.1 The operator shall submit a request for a start-up exemption to the APCO, ARB, and EPA in conjunction with or in advance of an application for Authority to Construct (ATC) associated with a furnace rebuild.

5.5.2 The operator shall submit to the APCO, ARB, and EPA any information deemed necessary by the APCO, ARB, or EPA to determine the appropriate length of start-up exemption. This information shall include, but is not limited to:

5.5.2.1 A detailed list of activities to be performed during start-up, and a reasonable explanation for the length of time needed to complete each activity;

5.5.2.2 A description of the material process flow rates, system operating parameters, etc., that the operator plans to evaluate during the process optimization;

5.5.2.3 Clearly identified control technologies or strategies to be utilized;

5.5.2.4 Explicit description of what physical conditions prevail during start-up periods that prevent the controls from being effective; and

5.5.2.5 Reasonably precise estimate as to when physical conditions will have reached a state that allows for the effective control of emissions.

5.5.3 Start up exemptions shall begin upon activation of the primary combustion system.

5.5.4 The approved length of the start-up exemption shall be determined by the APCO, ARB, and EPA at the time of the ATC issuance, but in any case, it shall not exceed the amount of time specified in Table 5. The approval for the startup exemption shall be in writing from each agency.

Table 5 – Maximum Start-up Time		
Type of Furnace	Maximum Start-up NOx control system that does not meet Section 5.5.4.2 provisions	Maximum Start-up NOx control system that meets Section 5.5.4.2 provisions
Container glass	70 days	100 days
Fiber-glass	40 days	105 days
Flat glass	104 days	208 days

5.5.4.1 Maximum start-up time for furnaces with NOx controls that do not meet any of the conditions of Section 5.5.4.2 is listed in the center column of Table 5.

5.5.4.2 Maximum start-up time column as shown in the rightmost column of Table 5 shall be the maximum startup time if the NOx control system meets one or more of the following conditions:

5.5.4.2.1 Is innovative,

5.5.4.2.2 Is not in common use,

5.5.4.2.3 Is not readily available from a commercial supplier,

5.5.4.2.4 Is funded as original research by a public agency.

5.5.5 During start-up period, the stoichiometric ratio of the primary furnace combustion system shall not exceed 5% excess oxygen, as calculated from

the actual fuel and oxidant stream flow measurements for combustion in the glass melting furnace, except during the time when the oxidant stream for an oxy-fuel fired furnace contains at least 50% oxygen.

- 5.5.6 The emission control system shall be in operation as soon as technologically feasible during start-up to minimize emissions.
- 5.5.7 Notifications shall be performed and records kept in accordance with Section 6.7.

5.6 Shutdown Requirements

- 5.6.1 The duration of shutdown, as measured from the time the furnace operations drop below the idle threshold specified in Section 3.17 to when all emissions from the furnace cease, shall not exceed 20 days.
- 5.6.2 The emission control system shall be in operation whenever technologically feasible during shutdown to minimize emissions.
- 5.6.3 Notifications shall be performed and records kept in accordance with Section 6.7.

5.7 Idling Requirements

- 5.7.1 The emission control system shall be in operation whenever technologically feasible during idling to minimize emissions.
- 5.7.2 Emissions of NO_x, CO, VOC, SO_x, and PM₁₀ during idling shall not exceed the amount as calculated using the following equation:

$$E_{i, \max} = E_i * Capacity$$

Where

$E_{i, \max}$ = maximum daily emission of pollutant i during idling, in pounds pollutant per day;

E_i = Applicable emission limit from Table 1, Table 2, Table 3, or Table 4 for pollutant i , in pounds pollutant per ton glass produced;

$Capacity$ = Furnace's permitted glass production capacity in tons glass produced per day.

- 5.7.3 Notifications shall be performed and records kept in accordance with Section 6.7.

5.8 Compliance Determination: Any source testing result, CEMS, or alternate emission monitoring method averaged value exceeding the applicable emission limits in Section 5.1, Section 5.2, Section 5.3, or Section 5.4 shall constitute a violation of the rule.

5.9 Monitoring Requirements

5.9.1 NO_x Emission Monitoring Requirements

The operator of any glass melting furnace shall implement a NO_x CEMS that is approved, in writing, by the APCO and EPA, and that meets the requirements of Sections 6.6. For a furnace battery, a single CEMS may be used to determine the total NO_x emissions from all the furnaces provided the emission measurements are made at the common stack.

5.9.2 CO and VOC Emission Monitoring Requirements

Section 5.9.2 shall be in effect on and after January 1, 2009.

5.9.2.1 For each furnace subject to Table 2 CO limits, the operator shall implement a CO CEMS that meets the requirements of Section 6.6.1, and that is approved, in writing, by the APCO.

5.9.2.2 For each furnace subject to Table 2 VOC limits, the operator shall implement a VOC CEMS that meets the requirements of Section 6.6.1, and that is approved, in writing, by the APCO.

5.9.2.3 In lieu of installing and operating a CEMS for CO or CEMS for VOC or both, an operator may propose key system operating parameter(s) and frequency of monitoring and recording.

5.9.2.3.1 The alternate monitoring shall meet the requirements of Section 6.6.2.

5.9.2.3.2 The operator shall obtain approval of the APCO and EPA for the specific key system operating parameter(s), monitoring frequency, and recording frequency used by the operator to monitor CO/VOC emissions.

5.9.2.3.3 The operator shall monitor approved key system operating parameter(s) at the approved monitoring frequency to ensure compliance with the emission limit(s) during periods of emission-producing activities.

5.9.2.3.4 Acceptable range(s) for key system operating parameter(s) shall be demonstrated through source test.

5.9.2.4 For the operator of multiple furnaces or a furnace battery utilizing Section 5.2.2 to comply with CO emission limits or VOC emission limits or both, a single parametric monitoring arrangement or a single CEMS may be used to determine the CO emissions or VOC emissions or both from all the furnaces provided that the multiple furnaces/furnace battery is subject to the provisions of Sections 9.6 through 9.7.8.5 and:

5.9.2.4.1 For units using a CEMS - the emission measurements are made at the common stack.

5.9.2.4.2 For units using a parametric monitoring arrangement - the key system operating parameters are representative of the combined exhaust stream.

5.9.3 SO_x Emission Monitoring Requirements

Section 5.9.3 shall be in effect on and after January 1, 2011. Flat glass furnace operators electing the Tier 4 early enhanced option shall be subject to the requirements of this section by the compliance date in Section 7.2.2.

5.9.3.1 For each furnace subject to Section 5.3, the operator shall implement a SO_x CEMS that meets the requirements of Section 6.6.1 and that is approved, in writing, by the APCO and EPA.

5.9.3.2 In lieu of installing and operating a CEMS for SO_x, an operator may propose key system operating parameter(s) and frequency of monitoring and recording.

5.9.3.2.1 The alternate monitoring shall meet the requirements of Section 6.6.2.

5.9.3.2.2 The operator shall obtain approval of the APCO and EPA for the specific key system operating parameter(s), monitoring frequency, and recording frequency used by the operator to monitor SO_x emissions.

5.9.3.2.3 The operator shall monitor approved key system operating parameter(s) at the approved monitoring frequency to ensure compliance with the emission

limit(s) during periods of emission-producing activities.

5.9.3.2.4 Acceptable range(s) for key system operating parameter(s) shall be demonstrated through source test.

5.9.3.3 For the operator of multiple furnaces or a furnace battery utilizing Section 5.3.4 to comply with SO_x emission limits, a single parametric monitoring arrangement or a single CEMS may be used to determine the SO_x emissions from all the furnaces provided that the multiple furnaces/furnace battery is subject to the provisions of Sections 9.6 through 9.7.8.5 and one of the following:

5.9.3.3.1 For units using a CEMS - the emission measurements are made at the common stack.

5.9.3.3.2 For units using a parametric monitoring arrangement - the key system operating parameters are representative of the combined exhaust stream.

5.9.4 PM10 Emission Monitoring Requirements

Section 5.9.4 shall be in effect on and after January 1, 2011. Flat glass furnace operators electing the Tier 4 early enhanced option shall be subject to the requirements of this section by the compliance date in Section 7.2.2.

5.9.4.1 The operator shall propose key system operating parameter(s) and frequency of monitoring and recording.

5.9.4.1.1 The parametric monitoring shall meet the requirements of Section 6.6.2.

5.9.4.1.2 The operator shall obtain approval of the APCO and EPA for the specific key system operating parameter(s), monitoring frequency, and recording frequency used by the operator to monitor PM10 emissions.

5.9.4.1.3 The operator shall monitor approved key system operating parameter(s) at the approved monitoring frequency to ensure compliance with the emission limit(s) during periods of emission-producing activities.

5.9.4.1.4 Acceptable range(s) for key system operating parameter(s) shall be demonstrated through source test.

5.9.4.2 In lieu of parametric monitoring, the operator may elect to implement a PM10 CEMS that meets the requirements of Section 6.6.1, and that is approved, in writing, by the APCO and EPA.

5.9.4.3 For the operator of multiple furnaces or a furnace battery utilizing Section 5.4.2 to comply with PM10 emission limits, a single parametric monitoring arrangement or a single CEMS may be used to determine the total PM10 emissions from all the furnaces provided that the multiple furnaces/furnace battery is subject to the provisions of Sections 9.6 through 9.7.8.5 and one of the following:

5.9.4.3.1 For units using a CEMS - the emission measurements are made at the common stack.

5.9.4.3.2 For units using a parametric monitoring arrangement – the key system operating parameters are representative of the combined exhaust stream.

5.10 Routine Maintenance of Add-On Emission Control Systems

During routine maintenance of an add-on emission control system, an operator of a glass melting furnace subject to the provisions of Sections 5.1 through 5.4 is exempt from these limits if:

5.10.1 Routine maintenance in each calendar year does not exceed 144 hours total for all add-on controls; and

5.10.2 Routine maintenance is conducted in a manner consistent with good air pollution control practices for minimizing emissions.

6.0 Administrative Requirements

6.1 Permitted Glass Production Capacity

Each glass melting furnace's PTO shall include the furnace's permitted glass production capacity in units of tons of glass pulled per day as a permit condition.

6.2 Operations Records

Section 6.2 shall be in effect through December 31, 2010.

6.2.1 Operators subject to the Table 1 Tier 2 NO_x emission limits shall maintain the records specified in Sections 6.2.1.1 through 6.2.1.3 for a period of five years, make them available on site during normal business hours, and submit them to the APCO, ARB, or EPA upon request.

6.2.1.1 Daily records of the total hours of operation, type and quantity of fuel used in each furnace, and/or the quantity of glass pulled from each furnace whichever matches the permit condition in the furnace's PTO.

6.2.1.2 Daily records of NO_x emission rate in lb/ton of glass pulled.

6.2.1.3 Records of source tests and operating parameters established during initial source test, maintenance and repair, malfunction, and idling, start-up and shutdown.

6.2.2 The following requirements shall apply from January 1, 2009 through December 31, 2010. Operators shall maintain daily records of:

6.2.2.1 CO emission rate in units matching Table 2 if CEMS is used for CO monitoring;

6.2.2.2 VOC emission rate in units matching Table 2, if CEMS is used for VOC monitoring;

6.2.2.3 For CO or VOC or both monitored using an approved parametric monitoring arrangement, operating values of the key system operating parameters.

6.2.3 The operator shall retain the records specified in Sections 6.2.1 and 6.2.2 for a period of five years, make them available on site during normal business hours to the APCO, ARB, or EPA, and submit them to the APCO, ARB, or EPA upon request.

6.3 Operations Records

Section 6.3 shall be in effect on and after January 1, 2011.

6.3.1 Operators shall maintain daily records of the following items:

- 6.3.1.1 Total hours of operation;
- 6.3.1.2 The quantity of glass pulled from each furnace;
- 6.3.1.3 NO_x emission rate in lb/ton glass pulled;
- 6.3.1.4 CO emission rate in units matching Table 2, if a CEMS is used;
- 6.3.1.5 VOC emission rate in units matching Table 2, if a CEMS is used;
- 6.3.1.6 SO_x emission rate in lb/ton glass pulled, if a CEMS is used;
- 6.3.1.7 PM₁₀ emission rate in lb/ton glass pulled, if a CEMS is used;
- 6.3.1.8 For container glass furnaces that are oxy-fuel fired:
 - 6.3.1.8.1 The weight of mixed color mix cullet used;
 - 6.3.1.8.2 The total amount of cullet used by weight; and
 - 6.3.1.8.3 The ratio, expressed in percent, of mixed color mix weight to total cullet weight.
- 6.3.2 For pollutants monitored using an approved parametric monitoring arrangement, operators shall record the operating values of the key system operating parameters at the approved recording frequency.
- 6.3.3 Operators shall maintain records of the following items:
 - 6.3.3.1 Source tests and source test results;
 - 6.3.3.2 The acceptable range for each approved key system operating parameter, as established during source test;
 - 6.3.3.3 Maintenance and repair; and
 - 6.3.3.4 Malfunction.
- 6.3.4 The operator shall retain records specified in Sections 6.3.1 through 6.3.3 for a period of five years; make the records available on site during normal business hours to the APCO, ARB, or EPA; and submit the records to the APCO, ARB, or EPA upon request.

6.4 Compliance Source Testing

- 6.4.1 Each glass melting furnace or a furnace battery shall be source tested at least once every calendar year, but not more than every 18 months and not sooner than every 6 months to demonstrate compliance with the applicable requirements of Section 5.0. Sources exempt under Section 4.3 are not required to source test for the exempted pollutants.
- 6.4.2 Source test conditions shall be representative of normal operations, but not less than 60 percent of the permitted glass production capacity.
- 6.4.3 For operators using alternative monitoring systems, during the source test, the operator shall monitor and record, at a minimum, all operating data for each parameter, fresh feed rate, and flue gas flow rate and submit this data with the test report.
- 6.4.4 During source testing in accordance with Section 6.4.1, the arithmetic average of three (3) 30-consecutive-minute test runs shall be used to determine compliance with NO_x, CO, VOC, and SO_x emission limits.
- 6.4.5 During source testing in accordance with Section 6.4.1, the arithmetic average of three (3) 60-consecutive-minute test runs shall be used to determine compliance with PM₁₀ emission limits.
- 6.4.6 For a given pollutant, if two of the three runs individually demonstrate emissions above the applicable limit, the test cannot be used to demonstrate compliance for the furnace, even if the averaged emissions of all three test runs is less than the applicable limit.

6.5 Test Methods

Compliance with the requirements of Section 5.0 shall be determined in accordance with the following source test procedures or their equivalents as approved by the EPA, ARB, and the APCO:

- 6.5.1 Oxides of nitrogen – EPA Method 7E, EPA Method 19, or ARB Method 100.
- 6.5.2 Carbon monoxide (ppmv) – EPA Method 10, or ARB Method 100.
- 6.5.3 Volatile Organic Compound (ppmv) – EPA Method 25A expressed in terms of carbon or ARB Method 100. EPA Method 18 or ARB Method 422 shall be used to determine emissions of exempt compounds.
- 6.5.4 Stack gas oxygen, carbon dioxide, excess air, and dry molecular weight – EPA Method 3 or 3A, or ARB Method 100.
- 6.5.5 Stack gas velocity and volumetric flow rate – EPA Method 2.

6.5.6 Oxides of sulfur – EPA Method 6C, EPA Method 8, or ARB Method 100.

6.5.7 The SOx emission control system efficiency shall be determined using the following:

6.5.7.1 EPA Method 2 for measuring flow rates; and

6.5.7.2 EPA Method 6C or EPA Method 8 for measuring total SOx (expressed as SO₂) concentrations at the inlet and outlet of the control device.

6.5.7.3 The SOx emission control system efficiency shall be calculated using the following equation:

$$\% \text{ Control Efficiency} = [(C_{\text{SO}_2, \text{inlet}} - C_{\text{SO}_2, \text{outlet}}) / C_{\text{SO}_2, \text{inlet}}] \times 100$$

Where:

$C_{\text{SO}_2, \text{inlet}}$ = concentration of SOx (expressed as SO₂) at the inlet side of the SOx emission control system, in lb/dscf

$C_{\text{SO}_2, \text{outlet}}$ = concentration of SOx (expressed as SO₂) at the outlet side of the SOx emission control system, in lb/dscf

6.5.8 Sulfur content of liquid fuel – American Society for Testing and Materials (ASTM) D 6428-99 or ASTM D 5453-99.

6.5.9 PM10 Test Methods

6.5.9.1 Filterable PM10 emissions - EPA Method 5; EPA Method 201; or EPA Method 201A. An operator choosing EPA Method 5 shall count all PM collected as PM10.

6.5.9.2 Condensable PM 10 emissions - EPA Method 202 with the following procedures:

6.5.9.2.1 Purge the impinger with dry nitrogen for one hour. The one-hour purge with dry nitrogen shall be performed as soon as possible after the final leak check of the system.

6.5.9.2.2 Neutralize the inorganic portion to a pH of 7.0. Use the procedure, "Determination of NH₄ Retained in Sample by Titration" described in Method 202 to neutralize the sulfuric acid. Neutralizing the

inorganic portion to a pH of 7.0 determines the un-neutralized sulfuric acid content of the sample without over-correcting the amount of neutralized sulfate in the inorganic portion.

6.5.9.2.3 Evaporate the last 1 ml of the inorganic fraction by air drying following evaporation of the bulk of the impinger water in a 105 degrees C oven as described in the first sentence of the Method 202 section titled "Inorganic Fraction Weight Determination."

6.6 Emissions Monitoring Systems

6.6.1 An approved CEMS shall comply with all of the following requirements:

6.6.1.1 Code of Federal Regulations Title 40 (40 CFR) Part 51;

6.6.1.2 40 CFR Part 60.7 (Notification and Record Keeping);

6.6.1.3 40 CFR Part 60.13 (Monitoring Requirements);

6.6.1.4 40 CFR Part 60 Appendix B (Performance Specifications);

6.6.1.5 40 CFR Part 60 Appendix F (Quality Assurance Procedures);
and

6.6.1.6 Applicable sections of Rule 1080 (Stack Monitoring).

6.6.2 An approved alternate emission monitoring method shall be capable of determining the furnace emissions on an hourly basis and shall comply with the following requirements:

6.6.2.1 40 CFR 64 (Compliance Assurance Monitoring); and

6.6.2.2 40 CFR 60.13 (Monitoring Requirements).

6.7 Notifications and Records for Start-up, Shutdown, and Idling

6.7.1 The operator of any glass melting furnace claiming an exemption under Section 4.4 shall notify the APCO by telephone at least 24 hours before initiating idling, shutdown, or start-up. The notification shall include: date and time of the start of the exempt operation, reason for performing the operation, and an estimated completion date.

6.7.2 The operator shall notify the APCO by telephone within 24 hours after completion of the start-up, shutdown, or idling.

6.7.3 The operator claiming exemption under Section 4.4 shall maintain all operating records/support documentation necessary to support claim of exemption.

6.7.4 Records/support documentation required by Section 6.7.3 shall meet the following requirements:

6.7.4.1 The records/support documentation shall be retained on-site for five years.

6.7.4.2 The records/support documentation shall be made available to the APCO, ARB, or EPA during normal business hours.

6.7.4.3 The records/support documentation shall be submitted to the APCO, ARB, or EPA upon request.

6.8 Records for Exempt Furnaces

6.8.1 An operator claiming exemption under Section 4.1, Section 4.2, or Section 4.3 shall maintain records/documentation necessary to support claim of exemption.

6.8.2 Records/support documentation specified in Section 6.8.1 shall meet the following requirements:

6.8.2.1 The records/documentation shall be retained on site for five years.

6.8.2.2 The records/documentation shall be made available to the APCO, ARB, or EPA during normal business hours.

6.8.2.3 The records/documentation shall be submitted to the APCO, ARB, or EPA upon request.

7.0 Compliance Schedule

7.1 Container Glass and Fiberglass Furnaces

7.1.1 For container glass/fiberglass furnaces, the operator must submit a completed Authority to Construct (ATC) application, if needed, by June 1, 2012; and be in full compliance with the Section 5.1 Table 1 Tier 3 NOx limits by January 1, 2014.

7.1.2 For a container glass/fiberglass furnace that is not meeting the applicable SOx limit in Section 5.3 Table 3 on January 1, 2009, the operator must

submit a completed ATC application, if needed, by June 1, 2009 and be in full compliance with the applicable SO_x emission limit by January 1, 2011.

- 7.1.3 For a container glass/fiberglass furnace that is not meeting the applicable PM₁₀ emission limit in Section 5.4 Table 4 on January 1, 2009, the operator must submit a completed ATC application, if needed, by June 1, 2009; and be in full compliance with the applicable PM₁₀ limit by January 1, 2011.

7.2 Flat Glass Furnaces

- 7.2.1 A flat glass operator, who does not commit to the Tier 4 early enhanced option in Section 5.1 Table 1, shall comply with the applicable deadlines specified in Sections 7.2.1.1 through 7.2.1.6.

- 7.2.1.1 The operator must submit a completed ATC application, if needed, by June 1, 2009; and be in full compliance with the Section 5.1 Table 1 Tier 3 NO_x limits by January 1, 2011.

- 7.2.1.2 By January 1, 2011, operators of flat glass furnaces shall submit, in writing, a letter signed by a responsible official. The letter shall include the following information:

- 7.2.1.2.1 Name and address of the facility;

- 7.2.1.2.2 A statement declaring whether the furnace will meet the Section 5.1 Table 1 Tier 4 standard option or the Tier 4 enhanced option;

- 7.2.1.2.3 The technology expected to be utilized to meet the stated Section 5.1 Table 1 Tier 4 option; and

- 7.2.1.2.4 Signature of responsible official with the person's printed name and title.

- 7.2.1.3 Operators utilizing the Section 5.1 Table 1 Tier 4 standard option shall submit a completed ATC application, if needed, by June 1, 2012; and be in full compliance with the Section 5.1 Table 1 Tier 4 standard option NO_x limits by January 1, 2014.

- 7.2.1.4 Operators utilizing the Section 5.1 Table 1 Tier 4 enhanced option shall submit a completed ATC application, if needed, by June 1, 2016; and be in full compliance with the Section 5.1 Table 1 Tier 4 enhanced option NO_x limits by January 1, 2018.

- 7.2.1.5 For a furnace that is not meeting the applicable SO_x emission limit in Section 5.3 Table 3 on January 1, 2009, the operator must submit a completed ATC application, if needed, by June 1, 2009 and be in full compliance with the applicable SO_x emission limit by January 1, 2011.
- 7.2.1.6 For a furnace that is not meeting the applicable PM₁₀ emission limit in Section 5.4 Table 4 on January 1, 2009, the operator must submit a completed ATC application, if needed, by June 1, 2009; and be in full compliance with the applicable PM₁₀ limit by January 1, 2011.
- 7.2.2 A flat glass operator, who commits to the Tier 4 early enhanced option in Section 5.1 Table 1, shall comply with the applicable emission limits by the compliance deadlines specified in Sections 7.2.2.1 through 7.2.2.3.
 - 7.2.2.1 By November 1, 2010, operators of flat glass furnaces shall submit, in writing, a letter signed by a responsible official. The letter shall include the following information:
 - 7.2.2.1.1 Name and address of the facility;
 - 7.2.2.1.2 A statement declaring the furnace will meet the Tier 4 early enhanced option, Section 5.1 Table 1 Tier 4 NO_x limit; Section 5.3 Table 3 SO_x limit; and Section 5.4 Table 4 PM₁₀ limit by January 1, 2014 or by the next furnace rebuild schedule, whichever is earlier;
 - 7.2.2.1.3 The technologies expected to be utilized to meet the stated Early Enhanced Option, Section 5.1 Table 1, Tier 4 NO_x limit; Section 5.3 Table 3 SO_x limit; and Section 5.4 Table 4 PM₁₀ limit; and
 - 7.2.2.1.4 Signature of responsible official with the person's printed name and title.
 - 7.2.2.2 By June 1, 2012, the operator shall submit a completed ATC application, if needed, for any furnace modifications to comply with the applicable NO_x, SO_x and PM₁₀ emission limits.
 - 7.2.2.3 Full compliance with the Section 5.1 Table 1 Tier 4 early enhanced option NO_x limits; Section 5.3 Table 3 SO_x limit; and Section 5.4 Table 4 PM₁₀ limit by January 1, 2014 or by the next furnace rebuild, whichever is earlier.

8.0 Calculations

- 8.1 The pollutant mass emission rate in lb/hr shall be converted to lb pollutant/ton of glass pulled according to the following equation:

$$lb\ emitted\ / ton\ of\ glass\ pulled = \frac{lb\ / hr\ emitted}{Pull\ rate\ in\ tons\ / hr}$$

- 8.2 100% air-fuel fired furnaces which have concentration limits in ppmv values shall be subject to the CO and VOC emission limits specified in Section 5.2. These limits are referenced at dry stack gas conditions and 8.0 percent by volume of stack oxygen. The CO and VOC emission concentrations shall be corrected to 8.0 percent oxygen by using the equation below, or an equivalent correction method that is approved, in writing, by each of the following: APCO, ARB, and EPA.

$$(ppmv\ CO)_{corrected} = \frac{12.9\%}{20.9\% - (\% O_2)_{measured}} \times (ppmv\ CO)_{measured}$$

$$(ppmv\ VOC)_{corrected} = \frac{12.9\%}{20.9\% - (\% O_2)_{measured}} \times (ppmv\ VOC)_{measured}$$

- 8.3 The operator of a oxy-fuel fired furnace, oxygen-assisted combustion furnace, or a furnace utilizing any fuel oxidants other than 100% ambient air, shall submit to the APCO, ARB, and EPA for approval any methodologies and data that will be used to calculate emission rates for NO_x, CO, and VOC if the methods are different than specified in Sections 8.1 or 8.2. Unless the operator received prior written approval from APCO, ARB, and EPA of all the calculation methods to be used that are different than specified in Sections 8.1 or 8.2, compliance with the emissions limits cannot be fully demonstrated, and it shall be deemed to be a violation of the rule.

9.0 Furnace Battery or Multiple Furnaces Control

- 9.1 As an alternative to complying with Section 5.1 Tier 2 NO_x emission limits, the operator of a furnace battery or multiple furnaces shall operate the furnace battery or multiple furnaces pursuant to Sections 9.2 through 9.6.2. Any violation of the requirements below shall be considered a violation of this rule, and a violation of the aggregated emission limits shall constitute a violation for each furnace for the entire averaging time.
- 9.2 Any operator who elects to comply with Section 9.0 in lieu of complying with the requirements of Section 5.1 Tier 2 NO_x emission limits shall be subject to a 10% environmental air quality benefit pursuant to 40 CFR 51 Subpart U. NO_x

emissions shall be at least 10% lower than the limits specified in Section 5.1 Tier 2.

9.3 The daily aggregate NO_x emissions, as determined in accordance with Section 9.6, shall be no greater than those obtained by controlling each furnace to comply individually with the limits in Section 5.1 Tier 2.

9.4 The operator shall conduct source testing of the furnace according to the requirements of Section 6.4.

9.5 Determination of Compliance

9.5.1 The operator shall calculate and record on a daily basis the aggregated emissions of furnaces which are subject to Section 9.2. Such records shall be kept for a period of five years. The operator shall notify the APCO of any violation of Section 9.3 within 24 hours. The notification shall include:

9.5.1.1 name and location of the facility;

9.5.1.2 identification of furnace(s) causing the exceedances;

9.5.1.3 the cause and the expected duration of exceedances;

9.5.1.4 calculation of actual NO_x, CO and VOC emissions;

9.5.1.5 corrective actions and schedules to complete the work.

9.5.2 The operator shall demonstrate compliance with the requirements of Section 9.3 through CEMS data or approved alternate emission monitoring methods, and source test results.

9.6 Determination of Aggregated Emissions

9.6.1 The aggregated emissions for a given pollutant of a furnace battery are the emissions for the pollutant as measured at the common stack divided by the sum of the daily glass pulled from each furnace.

9.6.2 The aggregated emissions of multiple furnaces for a given pollutant are the sum of each furnace's daily emissions for the pollutant divided by the sum of the daily glass pulled from each furnace.

9.7 Multiple Furnaces/Furnace Battery Requirements for Tier 3 NO_x, CO, VOC, SO_x and PM₁₀ Control

- 9.7.1 An operator of either furnace battery or multiple furnaces that elects to meet the emission limits for the furnaces through the requirements of this section shall be subject to a 10% air quality benefit in accordance with 40 CFR Part 51 Subpart U. The maximum emission rate shall be at least 10% lower than the applicable limit specified in Section 5.1 (Tier 3 NO_x), Section 5.2 (CO and VOC), Section 5.3 (SO_x), or Section 5.4 (PM₁₀), for each pollutant subject to this option.
- 9.7.2 The operator of a furnace battery or multiple furnaces choosing the alternate emission limit shall operate the furnace battery or multiple furnaces according to Sections 9.7.3 through 9.7.8.5. Only those pollutants with emissions that are averaged across multiple furnaces/furnace battery are subject to all subparts of Section 9.7. Pollutant emissions that are not averaged across multiple furnaces/furnace battery are subject to the applicable emission limits of Sections 5.1 through 5.4.
- 9.7.3 The daily aggregate emissions, as determined in accordance with Section 9.6, shall be no greater than those obtained by controlling each furnace to comply individually with applicable emission limits, less the 10% air quality benefit.
- 9.7.4 The operator shall demonstrate compliance with Section 9.7.3 through source test results and monitoring by either CEMS or approved alternate emission monitoring methods.
- 9.7.5 The operator shall conduct source testing of the furnaces according to the requirements of Section 6.4.
- 9.7.6 Records shall be kept in accordance with the applicable provisions of Section 6.0.
- 9.7.7 Any violation of the aggregated emission limits shall constitute a violation of the rule for each furnace for the entire averaging period.
- 9.7.8 The operator shall notify the APCO of any violation of Section 9.7.3 within 24 hours. The notification shall include:
- 9.7.8.1 Name and location of the facility;
 - 9.7.8.2 Identification of furnace(s) causing the violation;
 - 9.7.8.3 The cause and the expected duration of violation;

9.7.8.4 Calculation of actual NO_x, CO, VOC, SO_x, and PM₁₀ emissions during the violation;

9.7.8.5 Corrective actions and schedules to complete the work.