

Rule 1165

Glass Melting Furnaces

(A) General

(1) Purpose

- (a) The purpose of this rule is to limit the emissions of oxides of nitrogen (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and oxides of sulfur (SO_x) from glass melting furnaces.

(2) Applicability

- (a) This rule shall apply to any glass melting furnace.

(3) Exemptions

The provisions of this rule shall not apply to:

- (a) Except for section (D)(2)(a), 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 other fuels for startup may supply heat when the furnace contains no molten glass.
- (b) Except for section (D)(2)(a), the provisions of this rule shall not apply to any glass melting furnace that is designed to produce less than 4.55 Mg (5 tons) of glass per day.
- (c) The provisions of this rule shall not apply to hand glass melting furnaces.
- (d) The emission limits in Section (C)(1) Table 1 shall not apply during periods of startup, shutdown, or idling, provided the owner/operator complies with the applicable requirements of Section (C)(3), (C)(4), (C)(5), and (E)(3).

(B) Definitions

For the purpose of this rule the following definitions shall apply:

- (1) Air-Fuel Firing – Operation of a glass melting furnace where greater than 50 percent of the oxidant for the fuel comes from ambient air. 100 percent air-fuel fired means operation of a glass melting furnace where the oxidant is exclusively ambient air.

- (2) Block 24-hour Average – The arithmetic average of the hourly NO_x emission rates of a furnace as measured over 24 one-hour periods, daily, from 12:00 a.m. to 11:59 p.m., excluding periods of system calibration.
- (3) California Air Resources Board (CARB) – The California Air Resources Board, the powers and duties of which are described in Part 2 of Division 26 of the California Health & Safety Code (commencing with section 39500).
- (4) Container Glass – Any glass manufactured by pressing, blowing in molds, drawing, rolling, or casting which is used as a container as listed in Standard Industrial Classification 3221 (SIC 3221).
- (5) 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 acoustical insulating products for the construction industry.
- (6) Flat Glass – Any continuous flat glass sheets produced by the float, sheet, rolled, or plate glass process, which is used in windows, windshields, tabletops, or similar products listed in SIC 3211.
- (7) Furnace Rebuild – A cold repair that is commenced after the end of a furnace campaign period or expected life cycle of a furnace.
- (8) Glass Melting Furnace – 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, superstructures 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. The forming apparatuses, including the float bath used in flat glass manufacturing and flow channels in fiberglass manufacturing, are not considered part of the glass melting furnace.
- (9) Hand Glass Melting Furnace – A glass melting furnace where the molten glass is removed from the furnace by a glassworker using a blowpipe or a pontil.
- (10) 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 District permit.
- (11) Liquefied Petroleum Gas (LPG) – A general term for any of the following gasses: commercial propane, commercial butane, propane-butane (PB) mixtures, and special duty propane.
- (12) Oxygen-Assisted Combustion – Operation of a glass melting furnace where the oxidant is greater than the oxygen content in the ambient air or greater than 20.9 percent oxygen.

- (13) Oxy-Fuel Fired – Operation of a glass melting furnace where greater than 50 percent of the oxidant for the fuel is provided from enriched oxygen streams.
- (14) Permitted Glass Production Capacity – The maximum pull rate as stated in the District permit.
- (15) Primary Furnace Combustion System – The burners in a furnace that are used during the production of glass.
- (16) 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 grain of hydrogen sulfide per 100 standard cubic feet and no more than five grains total sulfur per 100 standard cubic feet.
- (17) Pull Rate – The amount of glass coming out of a glass melting furnace, expressed in short tons per day.
- (18) Rolling 30-day Average – The arithmetic average of the daily emission rates of a furnace over a contiguous 30-day period, excluding periods of system calibration.
- (19) Shutdown – The period of time during which a glass melting furnace is taken from operational to 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.
- (20) Startup – 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.
- (21) United States Environmental Protection Agency (USEPA) – The United States Environmental Protection Agency, the Administrator of the USEPA and his or her authorized representative.
- (22) Volatile Organic Compound (VOC) – Any volatile compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and those compounds listed in 40 CFR 51.100(s)(1).

(C) Requirements

- (1) Except as specified in section (A)(3)(d), the owner/operator of any glass melting furnace shall not operate a furnace in such a manner that results in NO_x, CO, or VOC emissions exceeding the limits in Table 1.

Table 1
NO_x, CO, and VOC Emission Limits

Type of Furnace	Combustion Type	NO_x	CO	VOC
Container Glass or Fiberglass	100% Air-Fuel Fired	4.0 lb/ton of glass pulled on a block 24-hour average	300 ppmv	20 ppmv
	Oxygen Assisted Combustion	4.0 lb/ton of glass pulled on a block 24-hour average	1.0 lb/ton of glass pulled	0.25 lb/ton of glass pulled
Flat Glass	100% Air-Fuel Fired	9.2 lb/ton of glass pulled on a block 24 hour average <i>and</i> 7.0 lb/ton of glass pulled on a rolling 30-day average	300 ppmv	20 ppmv
	Oxygen Assisted Combustion	9.2 lb/ton of glass pulled on a block 24 hour average <i>and</i> 7.0 lb/ton of glass pulled on a rolling 30-day average	0.9 lb/ton of glass pulled	0.1 lb/ton of glass pulled

- (2) All glass melting furnaces subject to Table 1 emission limits shall limit SO_x by:
- (a) Firing PUC-quality natural gas, propane, or LPG.
 - (b) Liquid fuel may be used as a backup fuel or standby fuel provided the liquid fuel contains no more than 15 ppm sulfur and the furnace exhaust is controlled by a SO_x emission control system with a control efficiency of 50 percent or greater.
- (3) Startup Requirements
- (a) The owner/operator shall submit a request for a startup exemption to the APCO, CARB, and the USEPA in conjunction with or in advance of an application for Authority to Construct (ATC) associated with a furnace rebuild.
 - (b) The owner/operator shall submit to the APCO, CARB, and the USEPA any information deemed necessary by the APCO, CARB, or the USEPA to determine the appropriate length of startup exemption. This information shall include, but is not limited to:

- (i) A detailed list of activities to be performed during startup, and a reasonable explanation for the length of time needed to complete each activity; and
 - (ii) A description of the material process flow rates, system operating parameters, etc., that the owner/operator plans to evaluate during the process of optimization; and
 - (iii) Clearly identified control technologies or strategies to be employed; and
 - (iv) Explicit description of what physical conditions prevail during startup periods that prevent the controls from being effective; and
 - (v) Reasonably precise estimate as to when physical conditions will have reached a state that allows for the effective control of emissions.
- (c) Startup exemptions shall begin upon activation of the primary combustion system.
- (d) The actual length of the startup exemption shall be determined by the APCO, CARB and USEPA at the time of the Authority to Construct (ATC) issuance, but in any case, it shall not exceed the amount of time specified in Table 2. The approval for the startup exemption shall be in writing from each agency.

Table 2
Maximum Startup Time

Type of Furnace	Column I	Column II
	Maximum Startup NO _x control system that meets section (C)(3)(d)(i) provisions	Maximum Startup NO _x control system that does not meet section (C)(3)(d)(i) provisions
Container glass	100 days	70 days
Fiber glass	105 days	40 days
Flat glass	208 days	104 days

- (i) Maximum startup time for Table 2, Column I, must have a NO_x control system that meets one or more of the following conditions:
 - a. Is innovative,
 - b. Is not in common use,
 - c. Is not readily available from a commercial supplier,
 - d. Is funded as original research by a public agency.

- (ii) Maximum startup time for those furnaces with NO_x controls that do not meet any of the conditions in section (C)(3)(d)(i) shall comply with startup times in Table 2, Column II.
 - (e) During the startup period, the stoichiometric ratio of the primary furnace combustion system shall not exceed five percent excess oxygen, as calculated from the actual fuel and oxidant flow measurements for combustion in the glass melting furnace.
 - (f) The emission control system shall be in operation as soon as technologically feasible during startup to minimize emissions.
 - (g) Notifications shall be performed and records shall be kept in accordance with section (D)(2).
- (4) Shutdown Requirements
- (a) The duration of shutdown, as measured from the time the furnace operations drop below the idle threshold as specified in section (B)(10) to when all emissions from the furnace cease, shall not exceed 20 days.
 - (i) The emission control system shall be in operation whenever technologically feasible during shutdown to minimize emissions.
 - (ii) Notifications shall be performed and records kept in accordance with section (D)(2).
- (5) Idling Requirements
- (a) The emission control system shall be in operation whenever technologically feasible during idling to minimize emissions.
 - (b) The NO_x, CO, and VOC emission during idling shall not exceed the amount calculated by multiplying the applicable emission limit of NO_x, VOC, or CO in pounds per ton of glass produced by the furnace permitted production capacity in tons of glass produced per day.
 - (c) Notifications shall be performed and records kept in accordance with section (D)(2).
- (6) Compliance Determination
- (a) The emissions measured for compliance with NO_x, CO, and VOC limits shall be averaged over a three hour period in accordance with the applicable test methods in section (E)(1), or, if a Continuous Emission Monitoring System (CEMS) or an alternate emission monitoring method is used, the applicable requirements of sections (E)(2)(a) or (E)(2)(b), respectively.

- (b) Any source testing result, CEMS, or alternate emission monitoring method averaged value exceeding the applicable emission limits in section (C)(1) shall constitute a violation of the rule. Any rolling 30-day averaged value from CEMS or alternate emission monitoring method that exceeds the applicable emission limit in (C)(1) shall constitute a violation of the rule for each day of the averaged period.
- (7) The owner/operator of any glass melting furnace shall implement a NO_x CEMS or a NO_x alternative emissions monitoring method on each furnace, that is approved in writing by the APCO, CARB, and USEPA, and that meets the requirements of section (E)(2).

(D) Monitoring and Records

(1) Administrative Requirements

(a) Permitted Glass Production Capacity and Fuel Use Capacity

Each permit to operate for a glass melting furnace shall specify a maximum daily glass production limit (units of tons of glass pulled per day) and maximum furnace heat input limit (MMBtu/hr) consistent with compliance with this rule.

(2) Operations Records

(a) The owner/operator of any glass melting furnace subject to section (C) or claiming exemption under section (A)(3) of this rule shall maintain an operating log for each furnace that includes, on a daily basis:

- (i) Total hours of operation;
- (ii) Type of fuel used in each furnace;
- (iii) Quantity of fuel used by each furnace, and the quantity of glass pulled by each furnace;
- (iv) NO_x emission rate in lb/ton of glass pulled.

(3) The Owner/Operator shall maintain records of source tests and operating parameters established during initial source test, maintenance, repair, and malfunction.

(4) The Owner/Operator shall maintain all records required by this rule for five-years, and shall produce those records for inspection by the APCO or his designee upon request.

(5) Compliance Source Testing

(a) Each glass melting furnace shall be source tested at least once every calendar year, but not more than once every 18 months and not sooner than every six months to demonstrate compliance with the applicable requirements of section (C).

- (b) Source test conditions shall be representative of normal operations, but not less than 60 percent of either the maximum glass production capacity or the furnace's maximum fuel use capacity for each furnace, whichever limit is stated in the PTO.
- (c) For source testing performed in accordance with section (D)(5)(a), the arithmetic average of three 30-consecutive-minute test runs shall apply. 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.

(E) Compliance Procedures and Test methods

(1) Test Methods

- (a) Oxides of Nitrogen – EPA Method 7E, EPA Method 19, or CARB Method 100.
- (b) Carbon monoxide (ppmv) – EPA Method 10, or CARB Method 100
- (c) Volatile Organic Compound (ppmv) – EPA Method 25A expressed in terms of carbon. EPA Test Method 18 or CARB Method 422 shall be used to determine emissions of exempt compounds.
- (d) Stack gas oxygen, carbon dioxide, excess air, and dry molecular weight – EPA Method 3 or 3A, or CARB Method 100.
- (e) Stack gas velocity and volumetric flow rate – EPA Method 2.
- (f) The SO_x emission control system efficiency shall be determined using the following:
 - (i) EPA Method 2 for measuring flow rates; and
 - (ii) EPA Method 6C or EPA Method 8 for measuring total SO_x (expressed as SO₂) concentrations at the inlet and outlet of the control device.
- (g) Alternative Test Methods
 - (i) Other test methods demonstrated to provide results that are acceptable for purposes of determining compliance with any provisions of this rule may also be used after review and approval in writing by the District, CARB and USEPA.

(2) Emissions Monitoring Systems

- (a) An approved CEMS shall comply with the most recently adopted version of all of the following requirements:

- (i) 40 CFR Part 51;
 - (ii) 40 CFR Part 60.7;
 - (iii) 40 CFR Part 60.13;
 - (iv) 40 CFR Part 60 Appendix B (Performance specifications);
 - (v) 40 CFR Part 60 Appendix F (Quality Assurance Procedures; and
 - (b) Any approved alternate emission monitoring method pursuant to the provisions of (E)(2)(a) above shall be capable of determining the furnace emissions on an hourly basis and shall comply with the following requirements:
 - (i) 40 CFR 64 (Compliance Assurance Monitoring); and
 - (ii) 40 CFR 60.13 (Monitoring Requirements).
- (3) Notifications and Records for Startup, Shutdown, and Idling
- (a) The owner/operator of any glass melting furnace claiming an exemption under section (A)(3)(c) shall notify the APCO by telephone at least 24 hours before initiating idling, shutdown, or startup. This notification shall include:
 - (i) Date and time of the start of the exempt operation; and
 - (ii) Reason for performing the operation; and
 - (iii) An estimated completion date.
 - (b) The owner/operator shall notify the APCO by telephone within 24 hours after completion of the idling, shutdown, or startup.
 - (c) The owner/operator claiming exemption under section (A)(3)(d) shall maintain all operating records and support documentation necessary to support claim of exemption, and shall meet the following requirements:
 - (i) The records and support documentation shall be retained on-site for five years; and
 - (ii) The records and support documentation shall be made available to the APCO, CARB, or USEPA during normal business hours; and
 - (iii) The records and support documentation shall be submitted to the APCO, CARB, or USEPA upon request.
- (4) Records for Exempt Furnaces
- (a) An owner/operator claiming exemption under section (A)(3)(a) or section (A)(3)(b) shall maintain records and documentation necessary to support claim of exemption.
 - (b) Records and support documentation specified in section (E)(4)(a) shall meet the following requirements:
 - (i) The records and support documentation shall be retained on-site for five years; and

- (ii) The records and support documentation shall be made available to the APCO, CARB, or USEPA during normal business hours; and
- (iii) The records and support documentation shall be submitted to the APCO, CARB, or USEPA upon request.

(5) Calculation Methods

- (a) The pollutant emission rate in ppmv shall be converted to lb/hr by using the appropriate conversion equations in ARB Method 100, EPA Method 19, or an equivalent conversion method approved, in writing, by the APCO, CARB, and the USEPA. The mass emission rate in lb/hr shall be converted to lb/ton of glass pulled according to the following equation:

$$\text{lbs of pollutant/ton of glass pulled} = \frac{\text{lb/hr of pollutant}}{\text{pull rate in tons/hr}}$$

- (b) 100 percent air-fuel fired furnaces that have concentration limits in ppmv values shall be subject to the CO and VOC emission limits specified in section (C)(1). 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 the APCO, CARB, and the USEPA.

$$(\text{ppmv CO})_{\text{corrected}} = \frac{12.9\%}{20.9\% - (\% \text{O}_2)_{\text{measured}}} \times (\text{ppmv CO})_{\text{measured}}$$

$$(\text{ppmv VOC})_{\text{corrected}} = \frac{12.9\%}{20.9\% - (\% \text{O}_2)_{\text{measured}}} \times (\text{ppmv VOC})_{\text{measured}}$$

- (c) The owner/operator of a oxy-fuel fired furnace, oxygen-assisted combustion furnace, or a furnace utilizing any fuel oxidants other than 100 percent ambient air, shall submit to the APCO, CARB, and USEPA 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 section (E)(5)(a) or (E)(5)(b). Unless the owner/operator received prior written approval from the APCO, CARB, and USEPA of all the calculation methods to be used that are different than specified in (E)(5)(a) or (E)(5)(b), compliance with the emission limits cannot be fully demonstrated, and it shall be deemed to be a violation of this rule.

(F) Violations

- (1) Failure to comply with any provision of this rule shall constitute a violation of the rule.
- (2) A violation of the limits contained in this rule as determined by any one of these test methods shall constitute a violation of this rule.

- (3) When one or more test method or set of test methods are specified for any testing, a violation of any requirement of this rule established by any one of the specified test methods or set of test methods shall constitute a violation of the rule.

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