

RULE 414, ~~NATURAL GAS-FIRED~~ WATER HEATERS, BOILERS AND PROCESS HEATERS RATED LESS THAN 1,000,000 BTU PER HOUR

**Adopted 08-01-96
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INDEX

100 GENERAL

- 101 PURPOSE
- 102 APPLICABILITY
- ~~110 EXEMPTION, LARGE WATER HEATERS~~
- ~~111~~10 EXEMPTION, WATER HEATERS IN RECREATIONAL VEHICLES
- ~~112~~1 EXEMPTION, POOL/SPA HEATERS~~WATER HEATERS IN SWIMMING POOLS AND HOT TUBS~~
- ~~113~~2 EXEMPTION, WATER HEATERS, BOILERS AND PROCESS HEATERS ~~USING A FUEL OTHER THAN NATURAL GAS~~ FIRED WITH LIQUEFIED PETROLEUM GAS

200 DEFINITIONS

- ~~201~~ 201 BOILER
- ~~202~~2 BRITISH THERMAL UNITBTU
- ~~203~~ HEAT INPUT
- ~~204~~3 HEAT OUTPUT
- ~~205~~ 205 LIQUEFIED PETROLEUM GAS
- ~~206~~4 MOBILE HOME WATER HEATER
- ~~207~~5 NATURAL GAS
- ~~208~~ 208 POOL/SPA HEATER
- ~~209~~ 209 PROCESS HEATER
- ~~207~~10 RATED HEAT INPUT CAPACITY
- ~~208~~11 RECREATIONAL VEHICLE
- ~~210~~ 212 WASTE HEAT RECOVERY BOILER
- ~~211~~ 213 WATER HEATER

300 STANDARDS

- ~~301~~ 301 NITROGEN OXIDES EMISSION LIMITS
- ~~302~~ 302 SELL-THROUGH OF WATER HEATERS, BOILERS AND PROCESS HEATERS

400 ADMINISTRATIVE REQUIREMENTS

- ~~401~~ 401 COMPLIANCE SCHEDULE
- ~~402~~1 CERTIFICATION REPORTREQUIREMENT
- ~~403~~2 MANUFACTURERS' LABELING REQUIREMENT
- ~~404~~ 404 CALCULATION FOR DETERMINATION OF HEAT OUTPUT
- ~~405~~ 405 CALCULATION FOR DETERMINATION OF STORAGE TANK CAPACITY

500 MONITORING AND RECORD KEEPING

- 501 TESTING PROCEDURE
- 502 DURATION OF RECORDS

100 GENERAL

- 101 **PURPOSE:** To limit the emission of nitrogen oxides (NO_x) from ~~natural gas-fired~~ water heaters, boilers and process heaters.
- 102 **APPLICABILITY:** This rule shall apply to any person who manufactures, distributes, offers for sale, sells, or installs any type of natural gas-fired water heater (such as tank or tankless/instantaneous), boiler or process heater, with a rated heat input capacity less than ~~75,000~~1,000,000 British thermal units per hour (Btu/hr), fired with gaseous or nongaseous fuels, for use in this District.
- ~~110~~ **EXEMPTION, LARGE WATER HEATERS:** ~~This rule shall not apply to water heaters with a rated heat input of 75,000 Btu/hr or greater.~~
- ~~114~~0 **EXEMPTION, WATER HEATERS IN RECREATIONAL VEHICLES:** This rule shall not apply to water heaters used in recreational vehicles.
- ~~112~~1 **EXEMPTION, POOL/SPA HEATERS ~~WATER HEATERS IN SWIMMING POOLS AND HOT TUBS~~:** This rule shall not apply to water pool/spa heaters with a heat input rating of less than 75,000 Btu/hr ~~used exclusively to heat swimming pools and hot tubs~~.
- ~~113~~2 **EXEMPTION, WATER HEATERS, BOILERS AND PROCESS HEATERS USING A FUEL OTHER THAN NATURAL GAS FIRED WITH LIQUEFIED PETROLEUM GAS:** This rule shall not apply to water heaters, boilers and process heaters ~~using any fuel other than natural gas~~ fired with liquefied petroleum gas.

200 DEFINITIONS

- 201 **BOILER:** Any external combustion equipment fired with any fuel used to produce hot water or steam, excluding waste heat recovery boilers.
- ~~204~~2 **BRITISH THERMAL UNIT (Btu) BTU:** ~~The amount of heat required to raise the temperature of one pound of water from 59 F to 60 F at one atmosphere~~ British thermal unit or units.
- ~~202~~3 **HEAT INPUT:** ~~The actual amount of heat released by natural gas burned in a water heater~~ The heat of combustion released by fuels burned in a unit based on the higher heating value of the fuel. This does not include the enthalpy of incoming combustion air.
- ~~203~~4 **HEAT OUTPUT:** The product H_o as defined in Section ~~404~~9.3 of the South Coast AQMD Protocol, as referenced in Section 501 of this rule.
- 205 **LIQUEFIED PETROLEUM GAS:** A compressed gas composed of one or more of the following flammable hydrocarbons: propane, n-butane, isobutane, propylene, and butenes.
- ~~204~~6 **MOBILE HOME WATER HEATER:** A ~~natural gas-fired~~ water heater manufactured exclusively for mobile home use.
- ~~205~~7 **NATURAL GAS:** A mixture of gaseous hydrocarbons containing at least 80 percent methane by volume as determined according to American Standard Test Method (ASTM) D1945-64.
- ~~206~~ **NATURAL GAS-FIRED WATER HEATER:** ~~A closed vessel in which water is heated by the combustion of natural gas and is withdrawn for use external to the vessel at pressures not exceeding 160 psig, including the apparatus by which heat is generated and all controls and devices necessary to prevent water temperatures from exceeding 210 F (99 C).~~
- 208 **POOL/SPA HEATER:** A device in which water is heated when pool or spa water circulates through a heat exchanger.

- 209 **PROCESS HEATER:** Any unit fired with any fuel which transfers heat from combustion gases to water or process streams. Process heater does not include any dryer in which the material being dried is in direct contact with the products of combustion, cement or lime kilns, glass melting furnaces or smelters.

- ~~207~~10 **RATED HEAT INPUT CAPACITY:** The heat input capacity specified on the nameplate of the combustion unit. If the combustion unit has been altered or modified such that its maximum heat input is different than the heat input capacity specified on the nameplate, the new maximum heat input shall be considered as the rated heat input capacity.

- ~~208~~11 **RECREATIONAL VEHICLE:** A motor home, travel trailer, truck camper, or camping trailer, with or without motive power, designed for human habitation for recreational, emergency, or other occupancy, ~~which meets all of the following criteria: 1) contains less than 320 square feet of internal living room area, excluding built-in equipment, including, but not limited to wardrobe, closets, cabinets, kitchen units or fixtures, and bath or toilet rooms; 2) it contains 400 square feet or less of gross area measured at maximum horizontal projections; 3) it is built on a single chassis; and 4) it is either self propelled, truck mounted, or permanently towable on the highways without a permit~~ as defined pursuant to Section 18010 of the California Health and Safety Code.

- 212 **WASTE HEAT RECOVERY BOILER:** A device that recovers normally unused energy and converts it to usable heat. Devices incorporating duct or supplemental burners that are designed to supply 50% or more of the total rated heat input capacity of the device are not considered waste heat recovery boilers, but are considered boilers. Waste heat recovery boilers are also referred to as heat recovery steam generators.

- 213 **WATER HEATER:** A closed vessel in which water is heated and is withdrawn for use external to the vessel at pressures not exceeding 160 psig, including the apparatus by which heat is generated and all controls and devices necessary to prevent water temperatures from exceeding 210 °F (99 °C).

300 STANDARDS

- 301 **NITROGEN OXIDES EMISSION LIMITS:** A person shall only distribute, offer for sale, sell, or install within the Sacramento Metropolitan Air Quality Management District ~~either of the following a water heater, boiler or process heater with certified NOx and CO emissions less than or equal to the following limits:~~
 - ~~301.1— A natural gas-fired water heater that emits less than or equal to 40 nanograms of nitrogen oxides (calculated as NO₂) per joule (93 pounds per billion Btu) of heat output; and is certified in accordance with Section 402.~~
 - ~~301.2— A mobile home natural gas-fired water heater that emits less than or equal to 50 nanograms of nitrogen oxides (calculated as NO₂) per joule (116 pounds per billion Btu) of heat output; and is certified in accordance with Section 402.~~

<u>Heat Input Range and Type</u>	<u>NOx Limit Nanograms per Joule of Heat Output (ppmv @ 3% O₂)*</u>			<u>CO Limit ppmv @ 3% O₂</u>
	<u>Effective 3/1/1997</u>	<u>Effective 1/1/2011</u>	<u>Effective 1/1/2013</u>	<u>Effective 1/1/2011</u>
<u>< 75,000 Btu/hr Mobile Home All others</u>	<u>50 40</u>	<u>40 (55) 10 (15)</u>		<u>No Limit No Limit</u>
<u>75,000 to < 400,000 Btu/hr Pool/Spa All others</u>	<u>No Limit No Limit</u>	<u>40 (55) 40 (55)</u>	<u>14 (20)</u>	<u>No Limit No Limit</u>
<u>400,000 to < 1million Btu/hr All Types</u>	<u>No Limit</u>	<u>14 (20)</u>		<u>400</u>

* Where limits are shown in units of both nanograms per joule of heat output and ppmv at 3% oxygen, compliance can be demonstrated using either limit.

302 **SELL-THROUGH OF WATER HEATERS, BOILERS AND PROCESS HEATERS:** An applicable water heater, boiler or process heater manufactured prior to the January 1, 2011 or the January 1, 2013 effective date specified for that unit in Section 301 may be distributed, offered for sale, or sold for up to 6 months after the specified effective date. In addition, a water heater, boiler or process heater manufactured before the effective date specified for that unit in Section 301 may be installed at any time, after the specified effective date, so long as it complied with the standards in Section 301 and 302 in effect at the time the unit was sold to the owner/operator of the water heater, boiler or process heater.

400 ADMINISTRATIVE REQUIREMENTS

~~401~~ **COMPLIANCE SCHEDULE:** ~~Effective March 1, 1997, no person shall distribute, offer for sale, sell, or install any natural gas-fired water heater which does not comply with the requirements of Section 300.~~

402~~1~~ **CERTIFICATION REQUIREMENT REPORT:**

402~~1~~.1 A manufacturer of any ~~natural gas-fired~~ water heater, boiler, or process heater subject to Section 300 shall submit to the Air Pollution Control Officer (APCO) a ~~statement certifying compliance report~~ that ~~water heaters demonstrates each model~~ manufactured by it and subject to this rule ~~are is~~ in compliance with the provisions of Section 300 at least 30 days prior to ~~sale being sold or distributed for sale within the District. Regardless of whether a permit is required, the manufacturer submitting a certification report must pay the fee in Rule 301, PERMIT FEES – STATIONARY SOURCE, Section 311. The compliance report shall include the following information:~~

- a. Name and address of manufacturer;
- b. Brand name and model;
- c. Model number as it appears on the rating plate;
- d. Fuel type unit is fired with;
- e. Description of each water heater model being certified;
- f. Heat input rating;
- g. All compliance test procedures and results, as performed by an independent testing laboratory, in accordance with Section 501;
- h. All calculations for determining compliance; and
- i. A signed and dated statement attesting to the accuracy of all statements and information in the compliance report.

401.2 In lieu of Sections 401.1(f) and 401.1(g), a manufacturer may submit to the District, at least 30 days prior to a model being sold or distributed for sale within the District, an approved South Coast Air Quality Management District (SCAQMD) certification pursuant to SCAQMD Rules 1121 or 1146.2.

~~The statement shall be signed, dated, and shall attest to the accuracy of all information. The statement shall include the brand name, model number, the input rating as it appears on the water heater rating plate, and test results in accordance with Section 501; or~~

~~402.2~~ ~~A manufacturer shall submit to this District an approved South Coast Air Quality Management District certification. Any model of natural gas-fired water heater certified as complying with the South Coast Air Quality Management District's Rule 1121 prior to July 1, 1995, need not be recertified to the test protocol specified in Section 501 until such time as required by the South Coast Air Quality Management District.~~

403~~2~~ **MANUFACTURERS' LABELING REQUIREMENT:** A manufacturer shall display the model number and the manufactured year of the water heater, boiler or process heater complying with Section 300 on the shipping carton and on the rating plate of each ~~water heater~~ unit. The manufacturer shall also display the certification status on the shipping carton and on the water heater, boiler or process heater.

~~404~~ **CALCULATION FOR DETERMINATION OF HEAT OUTPUT:** Heat output is computed using the following equation, as contained in the Protocol:

$$H_o = MC_{pi}(T_{del} - T_{in}) + V_{st}D_wC_{p2}(T_{max} - T_o)$$

Where:

- ~~H_o~~ = heat output in British thermal units.
- ~~M~~ = mass of the water withdrawn in pounds.
- ~~C_{pi}~~ = specific heat of water at the average temperature (T_{del} + T_{in})/2, British thermal units/pound °F.
- ~~T_{del}~~ = average delivery temperature °F.
- ~~T_{in}~~ = average inlet temperature °F.
- ~~V_{st}~~ = storage tank capacity in gallons, as determined in Section 405.
- ~~D_w~~ = density of water at the average temperature (T_{max} + T_o)/2 in pounds/gallon.
- ~~C_{p2}~~ = specific heat of water at the average temperature (T_{max} + T_o)/2 in British thermal units/pound °F.
- ~~T_{max}~~ = maximum mean tank temperature recorded after cutout following the test draw °F.
- ~~T_o~~ = the maximum mean tank temperature recorded prior to the test draw °F.

~~405~~ **CALCULATION FOR DETERMINATION OF STORAGE TANK CAPACITY:** Storage tank capacity is computed by the following equation:

$$V_{st} = (W_f - W_e) / D_w$$

Where:

- ~~V_{st}~~ = storage capacity of the water heater in gallons.
- ~~W_f~~ = weight of the water heater completely filled with water in pounds.
- ~~W_e~~ = weight of the empty water heater in pounds.
- ~~D_w~~ = density of water at the appropriate temperature in pounds/gallon.

500 MONITORING AND RECORD KEEPING

501 TESTING PROCEDURE:

~~501.1~~ Any natural gas-fired water heater, boiler or process heater ~~distributed, offered for sale, sold, or installed within the District to which this rule applies~~ shall be tested in accordance with the South Coast Air Quality Management District Protocol: *Nitrogen Oxides Emissions Compliance Testing for Natural Gas-Fired Water Heaters and Small Boilers*, as amended January 1995~~8~~.

~~501.2~~ Any water heater, boiler or process heater fired with a fuel other than natural gas, to which this rule applies, shall be tested in accordance with the test methods below. All emission determinations shall be made while the unit is operating according to the manufacturer's recommendations. Tests shall be conducted while the unit is operating at a firing rate that is as close as physically possible to the unit's recommended heat input capacity. Tests shall consist of three 40-minute sampling periods. Results shall be averaged over the three test periods. Test reports shall include the operational characteristics of all flue-gas NOx reduction equipment.

- a. Oxides of Nitrogen – ARB Method 100 or EPA Method 7E.
- b. Carbon Monoxide – ARB Method 100 or EPA Method 10.
- c. Stack Gas Oxygen – ARB Method 100 or EPA Method 3A.
- d. Carbon Dioxide – ARB Method 100 or EPA Method 3A.

502 **DURATION OF RECORDS:** A manufacturer shall keep test reports and certification records for as long as the water heater, boiler or process heater model is offered for sale or sold in

the District, or for three calendar years after manufacture, whichever is longer. These records shall be made available to the Air Pollution Control Officer upon request.