

**DRAFT ENGINEERING EVALUATION
PANORAMA CONDO OWNER'S ASSOCIATION
PLANT NO. 24067
APPLICATION NO: 29096
2190 BROADYWAY ST., SAN FRANCISCO, CA 94115**

BACKGROUND

Panorama Condo Owner's Association of San Francisco, CA is applying for an Authority to Construct an Emergency Standby Liquefied Petroleum Gas (LPG) Generator.

**S-1 Emergency Standby LPG Engine; Make: General Motors; Model: 5.7L; Model Year: 2017;
Max Rated Horsepower: 113.2 hp; Abated by Integral 3-way Catalyst;**

The Emergency Standby LPG Generator S-1 will be located at 2190 Broadway St., San Francisco, CA 94115. The primary emissions from S-1 include nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POC) from combustion of natural gas. Toxic air contaminants (TAC) including benzene, formaldehyde, and toluene are also emitted during combustion of natural gas. S-1 is abated by 3-way Catalyst A-1, which reduces NO_x, CO, and POC emissions through nonselective catalytic reduction. The Emergency Standby LPG Generator S-1 will be within 1,000 feet of The Hamlin School, Convent and Stuart Hall – Schools of Sacred Heart, and San Francisco Public Montessori School and will be within ¼ miles of Saint Vincent de Paul School.

EMISSION CALCULATIONS

Basis:

- 113.2 hp output rating
- Operating 50 hours per year
- Operating 24 hours maximum per day
- Maximum fuel usage of 0.83 MMBtu/hr
- LPG energy content of 2,500 btu/scf was assumed.
- A minimum abatement efficiency of 93% was provided by the manufacturer for NO_x, POC and CO. An abatement efficiency of 90% was assumed for NO_x, POC, and CO for a conservative estimate.

Annual Emissions and Daily Maximum Emissions:

The NO_x, CO, and POC emissions from the engine were calculated using emission factors provided by the manufacturer. The particulate matter (PM) and SO₂ emissions were calculated using emission factors from AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3. The daily maximum emissions were calculated assuming 24-hr/day of operation. The emissions from S-1 are summarized in Table 1.

Table 1 - Annual and Daily Emissions for S-1

Pollutant	Unabated E.F.	E.F. Unit	Abatement Efficiency (%)	Max Daily Emissions - Abated (lbs/day)	Abated Annual Emissions (lbs/yr)	Abated Annual Emissions (TPY)
NO _x	6.21+00 ^a	g/bhp-hr	90%	3.72	7.75	0.004
CO	2.21E+01 ^a	g/bhp-hr	90%	13.22	27.55	0.014
POC	9.92E-01 ^c	g/bhp-hr	90%	0.59	1.24	0.001
PM ₁₀	1.94E-02 ^b	lb/MMBtu	0%	0.38	0.80	0.000
PM _{2.5}	1.94E-02 ^b	lb/MMBtu	0%	0.38	0.80	0.000
SO ₂	5.88E-04 ^b	lb/MMBtu	0%	0.012	0.024	0.000

^a The emission factors for NO_x and CO were provided by the manufacturer.

^b The emission factors for PM₁₀ and SO₂ was retrieved from AP-42 Chapter 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3.

^c The emission factor for non-methane organic carbon was not available in the emission data provided by the manufacturer. Thus, the total hydrocarbon emission factor provided by the manufacturer was used for a conservative estimate of POC emissions, since the total hydrocarbon includes both non-methane and methane fraction.

Plant Cumulative Increase:

Table 2 summarizes the cumulative increase in criteria pollutant emissions that result from the operation of S-1.

Table 2 - Plant Cumulative Emissions

Pollutant	Existing Emissions (TPY)	New Increase (TPY)	Cumulative Emissions (TPY)
NO _x	0.000	0.004	0.004
CO	0.000	0.014	0.014
POC	0.000	0.001	0.001
PM ₁₀	0.000	0.000	0.000
PM _{2.5}	0.000	0.000	0.000
SO ₂	0.000	0.000	0.000

TOXIC HEALTH RISK ASSESSMENT

The TAC emission factors were retrieved from California Air Toxics Emission Factors (CATEF) for Natural Gas-fired Rich Burn Engines < 650 hp. The TAC emission estimates are based on uncontrolled emission factors for natural gas engines. S-1 equipped with 3-way catalyst is guaranteed by the vendor to reduce TAC emissions by at least 93%. However, for a conservative TAC emission estimate, an abatement efficiency of 50% was assumed for all TACs except benzene and formaldehyde. CATEF provided post-abatement emission factors for benzene and formaldehyde. Thus, no additional abatement credit was given for benzene and formaldehyde.

Based on the calculations in Tables 3 and 4 below, no TACs exceed the District's Risk Screening trigger levels set forth in Table 1 of Reg. 2-5 (New Source Review for Toxic Air Contaminants). Therefore, a Health Risk Assessment (HRA) is not required.

Table 3 - TAC Emission Estimates for TACs based on CATEF Emission Factors for Rich-burn, 4 Stroke, Natural Gas Engines < 650 HP

Compound	E.F. (lb/MMscf)	Hourly Abated Emissions (lb/hr)	Acute Trigger Level (lb/hr)	HRSA Triggered? (Y/N)	Annual Abated Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Y/N)
1,3-Butadiene	1.04E-01	1.72E-05	1.50E+00	No	8.58E-04	4.80E-01	No
Acetaldehyde	8.83E-01	1.46E-04	1.00E+00	No	7.28E-03	2.90E+01	No
Acrolein	5.47E-01	9.03E-05	5.50E-03	No	4.51E-03	1.40E+01	No
Benzene	7.39E-02	2.44E-05	6.00E-02	No	1.22E-03	2.90E+00	No
Ethylbenzene	1.16E-02	1.91E-06	None	No	9.57E-05	3.30E+01	No
Formaldehyde	4.99E-02	1.65E-05	1.20E-01	No	8.23E-04	1.40E+01	No
Naphthalene	7.65E-02	1.26E-05	None	No	6.31E-04	2.40E+00	No
PAH or derivatives	2.12E-04	3.49E-08	None	No	1.75E-06	3.30E-03	No
Benzo(a)anthracene	2.94E-04	4.85E-08	None	No	2.43E-06	None	No
Benzo(a)pyrene	1.15E-04	1.90E-08	None	No	9.49E-07	None	No
Benzo(b)fluoranthene	2.37E-04	3.91E-08	None	No	1.96E-06	None	No
Benzo(k)fluoranthene	1.03E-04	1.70E-08	None	No	8.50E-07	None	No
Chrysene	3.10E-04	5.12E-08	None	No	2.56E-06	None	No
Dibenz(a,h)anthracene	1.25E-05	2.06E-09	None	No	1.03E-07	None	No
Indeno(1,2,3-cd)pyrene	1.69E-04	2.79E-08	None	No	1.39E-06	None	No
PAH or derivative TOTAL	2.12E-04	3.49E-08	None	No	1.75E-06	3.30E-03	No
Propylene	1.60E+01	2.64E-03	None	No	1.32E-01	1.20E+05	No
Toluene	1.07E+00	1.77E-04	8.20E+01	No	8.83E-03	1.20E+04	No
Xylene	6.02E-02	9.93E-06	4.90E+01	No	4.97E-04	2.70E+04	No

STATEMENT OF COMPLIANCE

The owner/operator of S-1 shall comply with Reg. 6-1 (Particulate Matter and Visible Emissions Standards), Reg. 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations), and Reg. 9-8 (Nitrogen Oxides and Carbon Monoxide from Stationary ICE).

The owner/operator is expected to comply with Reg. 6-1 since the unit is fueled with LPG. Thus for any period aggregating more than three minutes in any hour, there should be no visible emission as dark or darker than No. 1 on the Ringlemann Chart (Regulation 6-1-301) and no visible emission to exceed 20% opacity (Reg. 6-1-302).

Based on Reg. 9-8-110.5 (Exemptions for Emergency Standby Engines), S-1 is exempt from the requirements of Reg. 9-8-301 (Emission Limits on Fossil Derived Fuel Gas), 9-8-302 (Emission Limits on Waste Derived Fuel Gas), 9-8-303 (Emissions Limits – Delayed Compliance, Existing Spark-Ignited Engines, 51 to 250 bhp or Model Year 1996 or Later), 9-8-304 (Emission Limits – Compression-Ignited Engines), 9-8-305 (Emission Limits – Delayed Compliance, Existing Compression-Ignited Engines, Model Year 1996 or Later), 9-8-501 (Initial Demonstration of Compliance) and 9-8-503 (Quarterly Demonstration of Compliance). However, S-1 is subject to the monitoring and record keeping procedures described in Reg. 9-8-530 (Emergency Standby Engines, Monitoring and Recordkeeping). The requirements of this Regulation are included in the permit conditions below.

S-1 is also subject to and expected to comply with Regulation 9-8-330 (Emergency Standby Engines, Hours of Operation) since non-emergency hours of operation will be limited in the permit conditions to 50 hours per year.

Sulfur oxides in the fuel are also very low since LPG is being used to fuel the engine. Sulfur compounds are removed from LPG at LPG processing plants prior to distribution.

The project is considered to be ministerial under the District's CEQA Reg. 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emissions factors and therefore is not discretionary as defined by CEQA. (Permit Handbook Chapter 2.3.2).

The project is within 1,000 feet from the nearest school and therefore is subject to the public notification requirements of Reg. 2-1-412. Notifications will be distributed to parents or guardians of children enrolled at The Hamlin School, Convent and Stuart Hall – Schools of the Sacred Heart, San Francisco Montessori School, and Saint Vincent de Paul School and all residential and business neighbors within 1,000 feet of the proposed new source.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

In accordance with Reg. 2-2-301 (Best Available Control Technology Requirement), BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NO_x, CO, SO₂, PM₁₀, or PM_{2.5}. Based on the emission calculations in Table 1, BACT is triggered for CO since the maximum daily emission for CO exceed 10 pounds per day.

BACT1 is not specified for spark ignition, natural gas fired emergency engines. BACT2 limits CO emission rate to 2.75 g/bhp-hr. At abatement efficiency of at least 90% from 3-way Catalyst A-1, S-1 is expected to comply with BACT2 for CO.

OFFSETS

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons per year of POC or NO_x. Based on the emission calculations in Table 1, offsets are not required for this application per Reg 2-2-302 (Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides).

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

S-1 is subject to 40 CFR 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines (ICEs), Section 60.4230(a)(4)(iv) because the engine is an emergency engine which was manufactured after January 1, 2009 and has a maximum power greater than 25 hp.

Section 60.4233(d) states owners and operators of stationary SI ICEs with a maximum engine power greater than 25 hp and less than 100 hp (except gasoline and rich burn engines that use LPG) must comply with emission standards in Table 1 to this subpart for their emergency stationary SI ICE.

From Table 1 for emergency engines between 25 hp and 130 hp, the emission standards are:

NO_x: 10 g/bhp-hr

CO: 387 g/bhp-hr

VOC: N/A

S-1 complies with the emission standards set forth in 40 CFR 60, Subpart JJJJ.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

S-1 is subject to 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE). Per 40 CFR 63.6590(c)(1), a new or reconstructed stationary RICE located at an area source must meet the requirements of 40 CFR 60, Subpart JJJJ for spark ignition engines. As stated above in the NSPS section, S-1 meets the emissions requirements of 40 CFR 60, Subpart JJJJ.

PERMIT CONDITIONS

Application # 29096: Panorama Condo Owner’s Association: Plant #24067: Conditions for S-1

PC 23107

1. The owner or operator shall operate the stationary emergency standby engine only to mitigate emergency conditions or for reliability-related activities (maintenance and testing). Operating while mitigating emergency conditions and while emission testing to show compliance with this part is unlimited. Operating for reliability-related activities are limited to 50 hours per year. (Basis: Emergency Standby Engines, Hours of Operation Regulation 9-8-330)
2. The Owner/Operator shall equip the emergency standby engine(s) with: a non-resettable totalizing meter that measures hours of operation or fuel usage. (Basis: Emergency Standby Engines, Monitoring and Record keeping 9-8-530)
3. The Owner/Operator shall not operate unless the natural gas fired engine is abated with a Catalytic Converter. (Basis: Cumulative Increase)
4. Records: The Owner/Operator shall maintain the following monthly records in a District-approved log for at least 24 months from the date of entry. Log entries shall be retained on-site, either at a central location or at the engine’s location, and made immediately available to the District staff upon request.
 - a. Hours of operation (maintenance and testing).
 - b. Hours of operation for emission testing.
 - c. Hours of operation (emergency).
 - d. For each emergency, the nature of the emergency condition.
 - e. Fuel usage or operating hours for engine.
 (Basis: Emergency Standby Engines, Monitoring and Recordkeeping 9-8-530)

RECOMMENDATION

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state, and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed source will be located within 1000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of the Authority to Construct for the following source:

By: _____
Alexander Sohn
Air Quality Engineer

Date: _____