

ENGINEERING EVALUATION REPORT

Palo Alto Unified School District

APPLICATION #: 27719

PLANT #: 20286

25 Churchill Avenue, Palo Alto, CA 94306

BACKGROUND

Palo Alto Unified School District has applied to obtain an Authority to Construct (AC) and/or a Permit to Operate (PO) for the following equipment:

**S-6 Emergency Standby Diesel Generator Set,
Caterpillar, Model: C15, Year 2015
546 BHP, 3.89 MMBTU/hr**

The **Emergency Standby Diesel Generator Set (S-6)** is equipped with the best available control technology (BACT) for minimizing the release of air borne criteria pollutants and harmful air toxins due to fuel combustion. The criteria pollutants are nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POC) from unburned diesel fuel, sulfur dioxide (SO₂) and particulate matter (PM₁₀).

The engine meets the Environmental Protection Agency and California Air Resources Board (EPA/CARB) Off-road standards: **Tier 3** for **S-6**. The engine will burn commercially available California low sulfur diesel fuel. The sulfur content of the diesel fuel will not exceed 0.0015% by weight. The operation of the engine should not pose any health threat to the surrounding community or the public at large.

This engine will be subject to attached condition no. **22850**.

EMISSIONS SUMMARY

S-6 has been certified by EPA Certification #: FCPXL15.2NYS-009 to be a cleaner burning engine. The SO₂ emissions were calculated based on the maximum allowable sulfur content (0.0015 wt% S) of the diesel fuel with assumption that all of the sulfur present will be converted to SO₂ during the combustion process.

Basis for S-6:

546 hp output rating

50 hr/yr operation for testing and maintenance

28.4 gallons/hr max fuel use rate

NMHC + NO_x, NO_x, HC, CO and PM₁₀ emission factors provided by manufacturer's data.

SO₂ emissions are quantified based on the full conversion of 0.0015 wt% (~ 15 ppm) sulfur in the ULS diesel fuel.

The SO₂ emission factor was derived from EPA AP-42, Table 3.4-1.

Annual Emissions:

Annual emissions are calculated based on the number of hours per year of operation for testing and maintenance. See Table 1.

Daily Emissions:

Daily emissions are calculated to establish whether a source triggers the requirement for BACT (10 lb/highest day total source emissions for any class of pollutants). 24-hr/day of operation will be assumed since no daily limits are imposed on intermittent and unexpected operations. See Table 1.

Table1: S-6 Emergency Standby Diesel Generator Set, Cummins, C15

| Pollutant | Emission Factor (g/kw-hr) | Emission Factor (g/hp-hr) | Annual Emissions (lb/yr) | Annual Emissions (TPY) | Max. Daily (lb/day) |
|-----------|---------------------------|---------------------------|--------------------------|------------------------|---------------------|
| NMHC+NOx | 3.351 | 2.500 | | | |
| NOx | 3.230 | 2.410 | 144.918 | 0.072 | 69.560 |
| POC | 0.080 | 0.060 | 3.607 | 0.001 | 1.731 |
| CO | 2.815 | 2.100 | 26.277 | 0.063 | 60.613 |
| PM10 | 0.174 | 0.130 | 7.817 | 0.003 | 3.752 |
| SO2 | | 0.001515 | 0.294 | 0.000 | 0.141 |

*lb SO2/MMBTU

Note: * From Table 3.4-1 of AP-42

PLANT CUMULATIVE INCREASE

Table 3 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-6.

Table 3. Cumulative increase in criteria pollutant emissions from operation of S-6

| Pollutant | Current Emissions (TPY) | Increase with this application (TPY) | Cumulative Emissions (TPY) | Max. Daily (lb/day) |
|------------------|-------------------------|--------------------------------------|----------------------------|---------------------|
| NOx | 0.014 | 0.072 | 0.086 | 69.560 |
| POC | 0.001 | 0.001 | 0.002 | 1.731 |
| CO | 0.013 | 0.063 | 0.076 | 60.613 |
| PM ₁₀ | 0.001 | 0.003 | 0.004 | 3.752 |
| SO ₂ | 0.000 | 0.000 | 0.0001 | 0.141 |

TOXIC RISK SCREENING ANALYSIS

This application required a Toxics Risk Screen because the diesel particulate emissions are greater than the toxic trigger level.

Table 4. Annual Toxic Emissions

| Toxic Pollutant Emitted | Emission Rate (lb/yr) | Risk Screening Trigger (lb/yr) |
|-------------------------|-----------------------|--------------------------------|
| S-6 Diesel Genset PM10 | 7.817 | 0.34 |

S-6 meets Best Available Control Technology for toxics (TBACT) since the diesel particulate emissions from this source is less than 0.15 g/bhp-hr. For an engine that meets the TBACT requirement, it must also pass the toxic risk screening level of less than ten in a million. Estimates of residential risk assume exposure to annual average toxic air contaminate concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume exposure occurs 8 hours per day, 245 days per year, for 40 years. Risk estimates for students assume a higher breathing rate, and exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years.

“As determined using the District’s HRSA Streamlining Policy Checklist for Stationary Emergency Standby and Fire Pump Diesel Engines, this application qualifies for the District’s May 6, 2015 HRSA Streamlining Policy for Stationary Diesel-Fired IC Engines Used for Backup Power or Fire Pumps. Based on this policy, the District has determined that this project will comply with District TBACT requirements and will result in health impacts of less than 10 in a million cancer risk and less than 1.0 chronic hazard index based on conservative HRSA screening procedures. Therefore, this project will comply with Regulation 2, Rule 5, Sections 301 and 302. A refined HRSA is not required for this application.”

BACT (BEST AVAILABLE CONTROL TECHNOLOGY)

In accordance with Regulation 2, Rule 2, Section 301, 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 or PM₁₀. Based on the emission calculations above, the owner/operator of **S-6** is subject to BACT for the following pollutants: **NO_x and CO**. BACT for S-6 is presented in the current BAAQMD BACT/TBACT Workbook for IC Engine – Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump, Document # 96.1.3, Revision 7 dated 12/22/2010.

| | | | |
|----------------|---|--------------------|------------|
| Source: | <i>IC Engine – Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump</i> | Revision: | 7 |
| | | Document #: | 96.1.3 |
| Class: | > 50 BHP Output | Date: | 12/22/2010 |

| POLLUTANT | BACT | |
|------------------|---|---|
| | 1. Technologically Feasible/ Cost Effective | TYPICAL TECHNOLOGY |
| | 2. Achieved in Practice | |
| | 3. TBACT | |
| POC | 1. n/s ^c 2. CARB ATCM standard ^a for POC at applicable horsepower rating (see attached Table 1). | 1. n/s ^c 2. Any engine certified or verified to achieve the applicable standard. ^a |
| NO _x | 1. n/s ^c 2. CARB ATCM standard ^a for NO _x at applicable horsepower rating (see attached Table 1). | 1. n/s ^c 2. Any engine certified or verified to achieve the applicable standard. ^a |
| SO ₂ | 1. n/s ^c 2. Fuel sulfur content not to exceed 0.0015% (wt) or 15 ppm (wt). | 1. n/s ^c 2. CARB Diesel Fuel (Ultra Low Sulfur Diesel) |
| CO | 1. n/s ^c 2. CARB ATCM standard ^a for CO at applicable horsepower rating (see attached Table 1). | 1. n/s ^c 2. Any engine certified or verified to achieve the applicable standard. ^a |
| PM ₁₀ | 1. n/s ^c 2. 0.15 g/bhp-hr 3. 0.15 g/bhp-hr | 1. n/s ^c 2. Any engine or technology demonstrated, certified or verified to achieve the applicable standard. 3. Any engine or technology demonstrated, certified or verified to achieve the applicable standard. |
| NPOC | 1. n/s ^c 2. n/s | 1. n/s ^c 2. n/s |

Reference:

a. ATCM standard (listed below): Where NMHC + NO_x is listed (with no individual standards for NO_x or NMHC) as the standard, the portions may be considered 95% NO_x and 5% NMHC. For the purposes of determining BACT NMHC = POC. Any engine which has been certified or demonstrated to meet the current year tier standard may be considered compliant with the certified emission standard for that pollutant.

b. Deleted (no longer applies).

c. Cost effectiveness analysis must be based on lesser of 50 hr/yr or non-emergency operation as limited by District health risk screen analysis.

Table 5: BACT 2 Emission Limits based on CARB ATCM

| Emissions Standards for Stationary Emergency Standby Diesel-Fueled CI Engines >50 BHP g/Kw-hr (g/bhp-hr) | | | |
|--|-------------|-----------------|-----------|
| Maximum Engine Power | PM | NMHC+NOx | CO |
| 37 < KW < 56 (50 < HP < 75) | 0.20 (0.15) | 4.7 (3.5) | 5.0 (3.7) |
| 56 < KW < 75 (75 < HP < 100) | 0.20 (0.15) | 4.7 (3.5) | 5.0 (3.7) |
| 75 < KW < 130 (100 < HP < 175) | 0.20 (0.15) | 4.0 (3.0) | 5.0 (3.7) |
| 130 < KW < 225 (175 < HP < 300) | 0.20 (0.15) | 4.0 (3.0) | 3.5 (2.6) |
| 225 < KW < 450 (300 < HP < 600) | 0.20 (0.15) | 4.0 (3.0) | 3.5 (2.6) |
| 450 < KW < 560 (600 < HP < 750) | 0.20 (0.15) | 4.0 (3.0) | 3.5 (2.6) |
| KW > 560 (HP > 750) | 0.20 (0.15) | 6.4 (4.8) | 3.5 (2.6) |
| | | | |

For **S-6**, BACT(2) requires emission factor for NO_x+NMHC to be 3.00 g/hp-hr or lower, with a 95% NO_x approximation BACT(2) standard of 2.85 g/hp-hr.; and BACT(2) requires the emission factor for CO to be 2.6 g/hp-hr or lower. BACT(1) has not been determined. **S-6** meets the BACT requirements based on the emission factor provided in the manufacturer’s emission specification taken from EPA Certification #: FCPXL15.2NYS-009.

OFFSETS

Table 6 summarizes the increase in criteria pollutant emissions that will result from the operation of **S-6**. It can be seen from Table 6 below that the operation of **S-6** does not trigger any offset. Therefore, offsets are not warranted for any emissions from this application.

Table 6. Increase in criteria pollutant emissions from operation of S-6 and offset trigger levels

| Pollutant | Current plant emissions (TPY) | Increase in plant emissions associated with this application (TPY) | Cumulative emissions (Current + Increase) (TPY) | Regulation 2-2-302 and 2-2-303 Offset Triggers (TPY) |
|------------------|--------------------------------------|---|--|---|
| NO _x | 0.014 | 0.072 | 0.086 | > 10; < 35 |
| POC | 0.001 | 0.001 | 0.002 | > 10; < 35 |
| CO | 0.013 | 0.063 | 0.076 | NA |
| PM ₁₀ | 0.001 | 0.003 | 0.004 | > 1* |
| SO ₂ | 0.000 | 0.000 | 0.000 | > 1* |

*Applies to major facilities with a cumulative increase, minus contemporaneous emission reduction credits, in excess of 1 ton/year since April 5, 1991.

NSPS (NEW SOURCE PERFORMANCE STANDARDS)

This engine is subject to 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines because it was manufactured after April 1, 2006, as required by Section 60.4200(a)(2)(i).

The S-6 engine has a total displacement of 15.2 liters and has 6 cylinders, so each cylinder has a volume of less than 10 liters. The engine is a 2015 model year engine and is not a fire pump. Section 60.4205(b) requires these engines to comply with the emission standards in Section 60.4202, which refers to 40CFR89.112 and 40CFR89.113 for all pollutants. For engines greater than 300 hp and less than 600 hp, these standards are:

NMHC+NO_x: 3.0 g/hp-hr

CO: 2.6 g/hp-hr

PM: 0.15 g/hp-hr

20% opacity during acceleration mode

15% opacity during lugging mode

50% opacity during peaks in acceleration or lugging mode

According to the manufacturer's emission data, under routine maintenance and normal operation, this engine (S-6) will comply with the standards.

Sections 60.4206 and 60.4211(a) require that the owner/operator operate and maintain the engine according to the manufacturer's written instructions or procedures developed by the owner or operator that are approved by the engine manufacturer, over the entire life of the engine. The owner/operator is expected to comply with this requirement.

Section 60.4207(a) requires that by October 1, 2007, the owner/operator must use fuel that complies with 40 CFR 80.510(a). This means that the fuel must have a sulfur content of 500 parts per million (ppm) maximum, a cetane index of 40 or a maximum aromatic content of 35 volume percent. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California.

Section 60.4207(b) requires that by October 1, 2010, the owner/operator must use fuel that complies with 40 CFR 80.510(b). This means that the fuel must have a sulfur content of 15 parts per million (ppm) maximum, and the same cetane index or aromatic content as above. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California.

Section 60.4209(a) requires a non-resettable hour meter. This requirement is already in the standard permit conditions.

The engine will comply with the requirements of Section 60.4211(c) because it has been certified in accordance with 40 CFR Part 89.

The engine will comply with the requirement in Section 60.4211(e) to run for less than 100 hours per year for maintenance checks and readiness testing, and the prohibition of running for any reason other than emergency operation, maintenance, and testing because they are limited by permit condition to 50 hours per year for reliability testing and otherwise may only operate for emergencies.

The owner/operator is not required to perform tests in accordance with Section 60.4212 or 60.4213.

Section 60.4214 states that owner/operators do not have to submit an initial notification to EPA for emergency engines.

Because the engine does not have a diesel catalyzed particulate filter, the owner/operator is not subject to Section 60.4214(c).

The owner/operator is required to comply with certain sections of 40 CFR 60, Subpart A, General Provisions. The owner/operator is expected to comply with this requirement.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHA)

This engine is not subject to the emission or operating limitations in 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, because it is an emergency stationary reciprocating internal combustion engine (40 CFR 63.6600(c)).

CARB STATIONARY DIESEL ENGINE AIR TOXICS CONTROL MEASURE (ATCM)

The State Office of Administrative Law approved the Airborne Toxic Control Measure (ATCM) on November 8, 2004. State law requires the local Air Districts to implement and enforce the requirements of the ATCM. Effective January 1, 2005, there is a prohibition on the operation of new diesel emergency standby engines greater than 50 bhp unless the following operating requirements and emission standards are met:

“Stationary Diesel Engine ATCM” section 93115, title 17, CA Code of Regulations.

Diesel PM – General Requirements

1. Meet 0.15 g/bhp-hr PM standard
2. Operate 50 hours per year, or less, for maintenance and testing (except emergency use and emissions testing)

or

1. Meet 0.01 g/bhp-hr PM standard
2. Operate up to 100 hours per year for maintenance and testing (except emergency use and emissions testing), upon approval by the District.

HC,NO_x, NMHC+NO_x, CO

1. Meet standards for off-road engines of the same model year and horsepower rating as specified in the OFF-Road Compression Ignition Engine Standards; or if no standards have been established
2. Meet the Tier 3 standards for an off-road engine for the same maximum rated power.

| Emission Standards for New Stationary Emergency Standby Diesel-Fueled CI Engine g/bhp-hr (g/kW-hr) | | | | |
|---|-------------------|-------------|----------------------------|-----------|
| Maximum Engine Power | Model Year | PM | NHMC+NO_x | CO |
| 50 ≤ HP < 75 (37 ≤ kW < 56) | 2007 | 0.15 (0.20) | 5.6 (7.5) 3.5 (4.7) | 3.7 (5.0) |
| | 2008+ | | | |
| 75 ≤ HP < 100 (56 ≤ kW < 75) | 2007 | 0.15 (0.20) | 5.6 (7.5) 3.5 (4.7) | 3.7 (5.0) |
| | 2008+ | | | |
| 100 ≤ HP < 175 (75 ≤ kW < 130) | 2007 | 0.15 (0.20) | 3.0 (4.0) | 3.7 (5.0) |
| | 2008+ | | | |
| 175 ≤ HP < 300 (130 ≤ kW < 225) | 2007 | 0.15 (0.20) | 3.0 (4.0) | 2.6 (3.5) |
| | 2008+ | | | |
| 300 ≤ HP < 600 (225 ≤ kW < 450) | 2007 | 0.15 (0.20) | 3.0 (4.0) | 2.6 (3.5) |
| | 2008+ | | | |
| 600 ≤ HP < 750 (450 ≤ kW < 560) | 2007 | 0.15 (0.20) | 3.0 (4.0) | 2.6 (3.5) |
| | 2008+ | | | |
| HP > 750 (kW > 560) | 2007 | 0.15 (0.20) | 4.8 (6.4) | 2.6 (3.5) |
| | 2008+ | | | |

The emergency standby diesel engine (S-6) is in compliance with the above ATCM requirements. This diesel engine will operate for no more than 50 hours per year for maintenance and reliability testing. This engine is also subject to the Current off-road CI engine standards for HC, NO_x, NMHC+NO_x and CO. As shown in the Table 8, the engine meets these requirements.

Table 8. ATCM Tier 3 Compliance for S-6

| | CARB Certification for S-6 g/bhp-hr | ATCM Tier 3 g/bhp-hr |
|----------------------|--|-------------------------|
| NMHC+NO _x | 2.5000 | 3.0000 |
| NO _x | 2.4100 | N/A |
| NMHC (POC) | 0.0600 | N/A |
| CO | 2.1000 | 2.6000 |
| PM | 0.1300 | 0.1500 |

STATEMENT OF COMPLIANCE

S-6 will be operated as an emergency standby engine and therefore is not subject to the emission rate limits in Regulation 9, Rule 8 (*NO_x and CO from Stationary Internal Combustion Engines*). S-6 is exempt from the requirements of Sections 9-8-301 through 305, 501 and 503 per Regulation 9-8-110.5 (*Emergency Standby Engines*). S-6 is subject to and expected to comply with 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.

S-6 is also subject to and expected to comply with monitoring and record keeping requirements of Regulation 9-8-530 and the SO₂ limitations of 9-1-301 (*Ground-level Concentration*) and 9-1-304 (0.5% by weight in fuel). Regulation 9-8-530 requirements are incorporated into the proposed permit conditions. Compliance with Regulation 9, Rule 1 is very likely since diesel fuel with a 0.0015% by weight sulfur is mandated for use in California.

Like all combustion sources, S-6 is subject to Regulation 6, Rule 1 (*Particulate Matter*). Regulation 6-1-303.1 limits opacity from internal combustion engines to Ringelmann 2. This engine is not expected to produce visible emissions or fallout in violation of this regulation and will be assumed to be in compliance with Regulation 6, Rule 1.

California Environmental Quality Act (CEQA)

This application is considered to be ministerial under the District's Regulation 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 emission factors in accordance with Permit Handbook Chapter 2.3.

Public Notification, Schools

This facility is less than 1,000 feet from the nearest school and therefore is subject to the public notification requirements of Regulation 2-1-412. The Palo Alto High School property line is 92 feet from S-6.

Prevention of Significant Deterioration (PSD)

PSD is not triggered.

PERMIT CONDITIONS

For S-6:

CONDITION 22850 -----

1. Operating for reliability-related activities is limited to 50 hours per year per engine.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]

2. The owner or operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, state or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating hours while mitigating emergency conditions or while emission testing to show compliance with District, state or Federal emission limits is not limited.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]

3. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(G)(1)]

4. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). 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 for reliability-related activities (maintenance and testing).
b. Hours of operation for emission testing to show compliance with emission limits.
c. Hours of operation (emergency).
d. For each emergency, the nature of the emergency condition.
e. Fuel usage for each engine(s).
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(I), (or Regulation 2-6-501)]

5. At School and Near-School Operation: If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply:

The owner or operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:

- a. Whenever there is a school sponsored activity (if the engine is located on school grounds).
- b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session "School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, playground, athletic field, or other areas of school property but does not include unimproved school property. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(1)] or (e)(2)(B)(2)]

End of Conditions

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 an Authority to Construct to **Palo Alto Unified School District** for the following source:

**S-6 Emergency Standby Diesel Generator Set,
Caterpillar, Model: C15 Year 2015,
546 BHP, 3.89 MMBTU/hr**

Prepared by: _____
 Marc Nash
 Air Quality Specialist II