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December 8, 2022

Mr. Daniel Czecholinski
Director, Air Quality Division
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

**RE: Class II Permit Application
Garkane Energy Cooperative Inc.**

Dear Mr. Czecholinski:

Garkane Energy Cooperative Inc. (Garkane) proposes to operate a Caterpillar diesel engine at their Fredonia, Arizona. As per Title 18, Chapter 2, Section 304.D.1 (R18-2-304.D.1) of the Arizona Administrative Code (A.A.C.), Garkane is submitting the enclosed application for a new Class II Air Quality Permit.

If you have any questions concerning this application or need additional details, please feel free to contact me using the phone number or email address noted below.

Sincerely,

Bryant Shakespear

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Garkane Energy Cooperative Inc.
Class II Permit Application
Place ID #108237
Fredonia, Arizona



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December 8, 2022

SIGN-OFF SHEET

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ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
AP-42	Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition
CAT	Caterpillar
CFR	Code of Federal Regulations
CH ₄	Methane
CI	Compression Ignition
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ e	Greenhouse Gases Expressed as Carbon Dioxide Equivalent Calculated by Summing the Individual Greenhouse Gas Emissions Multiplied by Their Global Warming Potential
dscf	Dry Standard Cubic Feet
dscfm	Dry Standard Cubic Feet Per Minute
EPA	U.S. Environmental Protection Agency
g	Gram
GHG	Greenhouse Gas
gr	Grains
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
hp	Horsepower
hr	Hour
ICE	Internal Combustion Engine
kW	Kilowatt
N ₂ O	Nitrous Oxide
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO _x	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review

ABBREVIATIONS (cont'd)

O&M	Operation and Maintenance
PM	Particulate Matter
PM ₁₀	Particulate Matter Less Than or Equal to 10 Microns in Aerodynamic Diameter
PM _{2.5}	Particulate Matter Less Than or Equal to 2.5 Microns in Aerodynamic Diameter
ppm	Parts Per Million
ppm _v	Parts Per Million by Volume
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
RICE	Reciprocating Internal Combustion Engines
SCC	Source Classification Code
SIC	Standard Industrial Classification
tpd	Tons per Day
tph	Tons per Hour
tpy	Tons per Year
TSP	Total Suspended Particulate
VOC	Volatile Organic Compounds
Yr	Year

1 INTRODUCTION

Garkane Energy Cooperative, Inc (Garkane) is proposing to relocate a permitted Tier 1 certified diesel engine from the state of Utah to their Fredonia, Arizona site. The engine is a Caterpillar 3516B unit equipped with both an oxidation catalyst and selective catalytic reduction (SCR). The engine is 2,593 horsepower (hp). Note that Garkane initially requested a permit determination from Arizona Department of Environmental Quality (ADEQ) on August 26, 2020, with receipt of a response on September 2, 2020. A Place # of 108237 was issued. Subsequent to that determination, no emission source of consequence remains on site.

As per Title 18, Chapter 2, Section 304.D.1 (R18-2-304.D.1) of the Arizona Administrative Code (A.A.C.), Garkane is submitting this application for a new Class II Air Quality Permit should the engine be moved to Arizona at a future date.

The following sections of this document provide the information required by A.A.C. R18-2-304 for a new permit application for a Class II source as set forth in ADEQ's Application Packet for Class II Permit. ADEQ's Standard Class II Permit Application Form and the Emission Source Form are presented in Appendix A and Appendix C, respectively. ADEQ's Application Administrative Completeness Checklist is provided in Appendix H.

2 PROCESS DESCRIPTION AND IDENTIFICATION OF EQUIPMENT SUBJECT TO PERMITTING

2.1 DESCRIPTION OF EACH PROCESS AT THE FACILITY

The Garkane facility is a small industrial complex located in Coconino County in north central Arizona and is comprised of the one diesel engine and two 1,500 gallon above ground storage tanks of diesel. The standard industrial classification (SIC) for Garkane is energy generation, SIC Code 4911. The facility may operate continuously for 24 hours per day (hr/day), but for a requested annual hourly limit of 4,500.

The engine will operate as part of the Western Area Power Administration (WAPA) when necessary, as part of their purchased “spinning reserves”.

2.1.1 Diesel Non-Emergency Internal Combustion Engines

The process flow diagram of the Diesel Non-Emergency ICE at the Garkane facility is presented in Figure D.1 of Appendix D. The Cat 2516B is proposed to be permitted in non-emergency situations.

2.1.2 Storage Tanks and Parts Cleaning

Garkane will utilize two 1,500-gallon diesel storage tanks to operate the Cat 3516B as appropriate. These storage tanks are considered insignificant or trivial activities (see Section 7) as both are less than 40,000 gallons per A.A.C. R18-2-101.68.

2.2 EQUIPMENT SUBJECT TO PERMITTING

The equipment associated with the Garkane facility that is subject to air quality permitting through ADEQ is presented in Table 2.1. Further detailed information about the equipment (maximum rated capacity, make, model, serial number, and date of manufacturer) is presented in Appendix B. Table 2.1 also presents the Source Classification Code (SCC) associated with each piece of equipment subject to air quality permitting as well as a reference to the applicable state A.A.C. and federal (NSPS and National Emission Standards for Hazardous Air Pollutants [NESHAP]) requirements. Further details about the applicable requirements are presented in Section 6.

All other equipment at the Garkane facility that is not identified in Table 2.1 is either an insignificant activity as defined in A.A.C. R18-2-101.68. Further information about this type of equipment is presented in Section 7.

Table 2.1 Equipment Subject to Air Quality Permitting

Equipment	A.A.C.	SCC	NSPS	NESHAP
Cat 3516B	R18-2-1101.B.81	20100102	N/A	ZZZZ

3 IDENTIFICATION AND DESCRIPTION OF POLLUTION CONTROLS

3.1 IDENTIFICATION AND DESCRIPTION

Identification and description of the pollution control equipment utilized at the Garkane facility is presented in Table 3.1.

The CAT 3516B is equipped with an oxidation catalyst and SCR combination provided by Safety Power. The expected outlet emissions are provided in Table 3.1. There is also the potential for ammonia slip. Emissions are discussed in Section 4.

3.2 REFERENCE TO APPLICABLE TEST METHODS

The requirements applicable to each process and/or piece of equipment at the Garkane facility are identified in Table 3.1 and described in Tables 6.1 through 6.5. The applicable test methods that can be used to determine compliance with the applicable emission standards include:

- Opacity Standard: U.S. Environmental Protection Agency (EPA) Reference Method 9, EPA Reference Method 22, or Visible Emission Surveys
- CO Emission Standard: EPA Reference Method 10 (Subpart ZZZZ)
- NO_x Emission Standard: EPA Reference Method 7E

Table 3.1 SCR/Catalyst Expected Emissions Outlet

Equipment	Pollutant	Emissions (g/hp-hr)	Exhaust Temp (F)	Exhaust Flow Rate (CFM)
Cat 3516B	NO _x	0.50	808	14,255
	CO	0.57		
	VOC	0.13		
	PM	0.02		

4 EMISSIONS CALCULATIONS

4.1 FACILITY-WIDE EMISSIONS AND PTE

Detailed information about the individual emission units associated with operations at the Garkane facility is identified in Tables 4.1-4.2. Table 4.1 presents all criteria pollutant and greenhouse gas emissions on an hourly and annual basis. Table 4.2 presents HAP emissions on an hourly and annual basis. The emission units listed in Tables 4.1 and 4.2 exclude the insignificant emission units/activities and trivial emission units/activities presented in Section 7.

The Garkane facility is a synthetic minor source of regulated air pollutants for permitting purposes under A.A.C. Title 19, Chapter 2, Articles 3 and 4.

As shown in Table 4.1, Garkane's facility-wide PTE is below the Class I (Title V) major source permitting thresholds, the Prevention of Significant Deterioration (PSD) major source thresholds (for attainment/non-categorical), and the HAP major source thresholds. Consequently, Garkane is a non-Title V, minor PSD, and minor HAP source in accordance with the A.A.C.

4.2 EMISSION FACTOR DOCUMENTATION

The methodology used to calculate potential emissions from the emission unit addressed in Section 4.1 is presented in Appendix E.

4.3 ELECTRONIC COPY OF EMISSION CALCULATIONS

An electronic copy of the emission calculations is provided in Appendix G. The Excel spreadsheets used to calculate emissions are reproduced in Appendix F.

Table 4.1 Facility-wide Criteria Pollutant and Greenhouse Gas Emissions

Pollutant	Engine Horsepower (hp)	Total Annual Operating Hours	Uncontrolled Tier 1 Emission Factor* (g/hp-hr)	Controlled Emission Factor (g/hp-hr)**	Controlled (lb/hr)	Controlled (tons/yr)
NO _x	2,593	4,500	6.87	0.50	2.86	6.43
CO			8.51	0.57	3.26	7.33
PM ₁₀			0.40	0.02	0.11	0.26
PM _{2.5}			0.40	0.02	0.11	0.26
VOC			0.97	0.13	0.74	1.67
SO ₂			1.21E-05	1.21E-05	0.03	0.07
CO ₂			1.16	1.16	3,007.88	6,767.73
CH ₄			6.35E-05	6.35E-05	0.16	0.37
CO ₂ e					3,011.99	6,776.98

* Cat 3516B Tier 1 Certification Factor or AP-42 Table 3.4-1 for SO₂, CO₂ and CH₄ (lb/hp-hr). CH₄ is 9% of TOC per footnote f

** All emissions but SO₂ for from Safety Power documentation

Table 4.2 Facility-wide HAP Emissions

Pollutant	Engine Horsepower (hp)	Total Annual Operating Hours	Emission Factor* (lb/MMBtu)	Emission Rate (lb/hr)	Emission Rate (tpy)
Benzene	2,593	4,500	7.76E-04	1.41E-02	3.17E-02
Toluene			2.81E-04	5.10E-03	1.15E-02
Xylene			1.93E-04	3.50E-03	7.88E-03
Formaldehyde			7.89E-05	1.43E-03	3.22E-03
Acetaldehyde			2.52E-05	4.57E-04	1.03E-03
Acrolein			7.88E-06	1.43E-04	3.22E-04
Naphthalene			1.30E-04	2.36E-03	5.31E-03
Acenaphthylene			9.23E-06	1.68E-04	3.77E-04
Acenaphthene			4.68E-06	8.49E-05	1.91E-04
Fluoranthene			1.28E-05	2.32E-04	5.23E-04
Phenanthrene			4.08E-05	7.41E-04	1.67E-03
Anthracene			1.23E-06	2.23E-05	5.02E-05
Fluoranthene			4.03E-06	7.31E-05	1.65E-04
Pyrene			3.71E-06	6.73E-05	1.52E-04
Benz(a)anthracene			6.22E-07	1.13E-05	2.54E-05
Chrysene			1.53E-06	2.78E-05	6.25E-05
Benzo(b)fluoranthene			1.11E-06	2.01E-05	4.53E-05
Benzo(k)fluoranthene			2.18E-07	3.96E-06	8.90E-06
Benzo(a)pyrene			2.57E-07	4.66E-06	1.05E-05
Indeno(1,2,3-cd)pyrene			4.14E-07	7.51E-06	1.69E-05
Dibenz(a,h)anthracene			3.46E-07	6.28E-06	1.41E-05
Benzo(g,h,i)perylene			5.56E-07	1.01E-05	2.27E-05
Total				2.86E-02	6.43E-02

* All factors are derived from AP-42 Table 3-3 and 3-4

5 PROPOSED VOLUNTARY LIMITATIONS

Garkane proposes to accept a voluntary limitation of 4,500 hours per year for the CAT 3516B engine.

6 APPLICABLE REQUIREMENTS AND PROPOSED EXEMPTIONS FROM OTHERWISE APPLICABLE REQUIREMENTS

6.1 APPLICABLE REQUIREMENTS

Identification of the specific regulatory requirements applicable to the CAT 3516B engine is presented in Table 6.1. General facility-wide requirements are presented in Table 8.1. The methods used by Garkane to determine compliance with the applicable regulatory requirements are also presented in Tables 8.1 through 8.20.¹

6.2 PROPOSED EXEMPTION FROM OTHERWISE APPLICABLE REQUIREMENTS

Garkane does not propose to be exempt from any otherwise applicable regulatory requirement.

¹ While identification of the specific regulatory requirements and the methods used to determine compliance is not required by Section 3.2, Standard Class II Permit Application Components of ADEQ's Application Packet for Class II Permit, it is included as part of the application for purposes of clarification and completeness.

Table 6.1 Applicable Facility-Wide Regulatory Requirements and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
A.A.C. R18-2-309.2.a	Submit compliance certification no less frequently than annually.	Record of Semiannual Compliance Certification.
A.A.C. R18-2-310.01.A	Report excess emissions in two parts: a) Notification by telephone or fax within 24 hours of first learning of excess emissions that includes all available information from A.A.C. R18-2-310.01.B, and b) Submittal of a written report within 72 hours of the telephone or fax notification that contains the information required by A.A.C. R18-2-310.01.B.	Facility procedures; training; records of submittals.
A.A.C. R18-2-315.A	Post the permit or certificate of permit issuance at the equipment site in such a manner as to be clearly visible and accessible. Mark all equipment covered by the permit with the current permit number or a serial number or other equipment number that is also listed in the permit to identify that piece of equipment.	Inspection confirming permit posting in the Environmental Office Conference Room. Inspection confirming all equipment covered by the permit is clearly marked with current permit number and permit equipment ID number.
A.A.C. R18-2-315.B	Maintain a complete copy of the permit on the site.	Inspection confirming complete Permit is maintained in the Environmental Office.
A.A.C. R18-2-326	Payment of applicable fees.	Record of fees paid pursuant to A.A.C. R18-2-326.C.1 and 2.

Table 6.1 Applicable Facility-Wide Regulatory Requirements and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
A.A.C. R18-2-327.A	Submit annual emission inventory questionnaires.	Record of Annual Emissions Inventory Questionnaires submitted to the Director by the due date.
40 CFR 82	Comply with all applicable requirements including monitoring, recordkeeping, and reporting requirements of 40 CFR 82 (Protection of Stratospheric Ozone).	Standard operating procedures; records review; management of change procedures.

Table 6.2 Applicable Regulatory Requirements of A.A.C. R18-2-306.01 and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
A.A.C. R18-2-306.01	Limit emissions as described in Section 5.	Operation and maintenance records.
A.A.C. R18-2-306.01	Comply with the operational limitations in Section 5.	Facility procedures; maintenance and operation records.

Table 6.3 Applicable Regulatory Requirements of A.A.C. R18-2-702.B.3 and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>A.A.C. R18-2-702.B.3 A.A.C. R18-2-702.C</p>	<p>For all sources described in A.A.C. R18-2-702.A (except as otherwise provided in Title 18, Chapter 2 of the A.A.C. relating to specific types of sources):</p> <ul style="list-style-type: none"> • Opacity \leq 20% <p>If the presence of uncombined water is the only reason for an exceedance of the opacity limit, the exceedance shall not constitute a violation.</p>	<p>Records of visual surveys; facility procedure.</p>

Table 6.4 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.1 and 40 CFR 63 Subpart A and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements ^a	Methods Used to Demonstrate Compliance
40 CFR 63.1(b)(3) A.A.C. R18-2-1101.B.1	When it is determined that the source that is in the relevant source category is not subject to a relevant standard or other requirement established under 40 CFR 63, keep a record as specified in 40 CFR 63.10(b)(3).	Facility procedure; non-applicability records.
40 CFR 63.1(c)(1) A.A.C. R18-2-1101.B.1	If a relevant standard has been established under 40 CFR 63, comply with the provisions of that standard and of 40 CFR 63 Subpart A as provided in 40 CFR 63.1(a)(4).	Management of change procedure.
40 CFR 63.1(c)(5) A.A.C. R18-2-1101.B.1	If an area source that otherwise would be subject to an emission standard or other requirement established under 40 CFR 63 if it were a major source subsequently increases its emissions of HAPs (or its PTE of HAPs) such that the source is a major source that is subject to the emission standard or other requirement, such source also shall be subject to the notification requirements of 40 CFR 63 Subpart A.	Management of change procedure; records of notification (if necessary).
40 CFR 63.4(b) A.A.C. R18-2-1101.B.1	Do not build, erect, install, or use any article, machine, equipment, or process to conceal an emission that would otherwise constitute noncompliance with a relevant standard.	Facility procedure.
40 CFR 63.5(b)(4) A.A.C. R18-2-1101.B.1	After the effective date of any relevant standard promulgated by the Administrator under 40 CFR 63, notify the Administrator of any intended construction or reconstruction when constructing a new affected source that is not major-emitting or reconstructing an affected source that is not major-emitting that is subject to such standard, or reconstructing a source such that the source becomes an affected source subject to the standard. The notification must be submitted in accordance with the procedures in 40 CFR 63.9(b).	Management of change procedure; records of notifications (if necessary).

Table 6.4 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.1 and 40 CFR 63 Subpart A and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements ^a	Methods Used to Demonstrate Compliance
40 CFR 63.6(a)(2) A.A.C. R18-2-1101.B.1	If an area source that otherwise would be subject to an emission standard or other requirement established under 40 CFR 63 if it were a major source subsequently increases its emissions of HAPs (or its PTE of HAPs) such that the source is a major source, such source shall be subject to the relevant emission standard or other requirement.	Management of change procedure.
40 CFR 63.6(e) A.A.C. R18-2-1101.B.1	At all times, including periods of startup, shutdown, and malfunction, operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. During a period of startup, shutdown, or malfunction, this general duty to minimize emissions requires that emissions from the affected source be reduced to the greatest extent which is consistent with safety and good air pollution control practices.	Facility procedure; operation and maintenance records.
40 CFR 63.9(b)(1)(ii) A.A.C. R18-2-1101.B.1	If an area source that otherwise would be subject to an emission standard or other requirement established under 40 CFR 63 if it were a major source subsequently increases its emissions of HAPs (or its PTE of HAPs) such that the source is a major source that is subject to the emission standard or other requirement, such source shall be subject to the notification requirements of 40 CFR 63.9.	Management of change procedure; records of notifications (if necessary).
40 CFR 63.9(b)(5)(i) A.A.C. R18-2-1101.B.1	Submit a notification of intention to construct a new affected source, reconstruct an affected source, or reconstruct a source such that the source becomes an affected source	Management of change procedure; records of notification (if necessary).
40 CFR 63.9(b)(5)(ii) A.A.C. R18-2-1101.B.1	Submit a notification of the actual date of startup of the source, delivered or postmarked within 15 calendar days after that date.	Management of change procedure; records of notifications (if necessary).

Table 6.4 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.1 and 40 CFR 63 Subpart A and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements ^a	Methods Used to Demonstrate Compliance
40 CFR 63.9(h)(3) A.A.C. R18-2-1101.B.1	Comply with all requirements for compliance status reports contained in the Title V permit, including reports required under 40 CFR 63. When notification of compliance status is required under 40 CFR 63, submit the notification of compliance status to the appropriate permitting authority following completion of the relevant compliance demonstration activity specified in the relevant standard.	Facility procedure; records of compliance status reports and notifications.
40 CFR 63.10(b)(1) A.A.C. R18-2-1101.B.1	Maintain files of all information (including all reports and notifications) required by 40 CFR 63 recorded in a form suitable and readily available for expeditious inspection and review. The files shall be retained for at least 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent 2 years of data shall be retained on site. The remaining 3 years of data may be retained off site. Such files may be maintained on microfilm, on a computer, on computer floppy disks, on magnetic tape disks, or on microfiche.	Facility procedure; record retention policy; records review.
40 CFR 63.10(b)(3) A.A.C. R18-2-1101.B.1	If it is determined that a stationary source that emits (or has the PTE, without considering controls) one or more HAPs regulated by any standard established pursuant to section 112(d) or (f), and that stationary source is in the source category regulated by the relevant standard, but that source is not subject to the relevant standard (or other requirement established under 40 CFR 63) because of limitations on the source's PTE or an exclusion, keep a record of the applicability determination on site at the source for a period of 5 years after the determination, or until the source changes its operations to become an affected source, whichever comes first.	Management of change procedure; records of applicability determinations (if necessary); record retention policy.

^a The individual subparts of 40 CFR 63 provide more details about the applicability of the general provisions of 40 CFR 63 Subpart A.

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
40 CFR 63.6603(a) (Table 2d, Entry 3) A.A.C. R18-2-1101.B.81	Comply with the following testing standards: <ul style="list-style-type: none"> • Limit concentration of CO in the stationary RICE exhaust to 23 ppmvd at 15 percent O₂; OR • Reduce CO emissions by 70 percent or more; 	O&M plans; facility procedures; inspection, and maintenance records.
40 CFR 63.6604(a) A.A.C. R18-2-1101.B.81	For an existing non-emergency, non-black start CI stationary RICE with a site rating of more than 300 brake HP with a displacement of less than 30 liters per cylinder that uses diesel fuel, you must use diesel fuel that meets the requirements in 40 CFR 1090.305 for nonroad diesel fuel. The requirements of 40 CFR 1090.305 include: <ul style="list-style-type: none"> • Sulfur content ≤ 15 ppm; and • Cetane index ≥ 40 or aromatic content ≤ 35% by volume. 	Facility procedure; records of fuel specifications from fuel supplier.
40 CFR 63.6605(a) A.A.C. R18-2-1101.B.81	Be in compliance with the emission limitations, operating limitations, and other applicable requirements of 40 CFR 63 Subpart ZZZZ at all times.	O&M plans; facility procedures; operation inspection, and operation and maintenance records.

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>40 CFR 63.6605(b) A.A.C. R18-2-1101.B.81</p>	<p>Operate and maintain any affected source in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require any further efforts to reduce emissions if levels required by 40 CFR 63 Subpart ZZZZ have been achieved. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.</p>	<p>O&M plans; facility procedures; operation inspection, and operation and maintenance records.</p>

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>40 CFR 63.6612(a) (Table 4, Entry 1,3) A.A.C. R18-2-1101.B.81</p>	<p>The source must conduct any initial performance test or other initial compliance demonstration according to Tables 4 and 5 to this subpart that apply to you within 180 days after the compliance date that is specified for your stationary RICE in §63.6595.</p> <p>Reduction of CO or formaldehyde emissions:</p> <ul style="list-style-type: none"> i. Select the sampling port location and the number/location of traverse points at the inlet and outlet of the control device; and ii. Measure the O₂ at the inlet and outlet of the control device; and iii. Measure the CO at the inlet and the outlet of the control device OR <p>Reduction of formaldehyde emissions</p> <ul style="list-style-type: none"> iii. Measure moisture content of the stationary RICE exhaust at the sampling port location; and iv. Measure formaldehyde at the exhaust of the stationary RICE; or v. Measure CO at the exhaust of the stationary RICE 	<p>Method 3, 3A or 3B of 40 CFR part 60, Appendix A-2 or ASTM Method D6522-00</p> <p>Formaldehyde: Method 320 or 323 of 40 CFR part 63, appendix A; or ASTM D6348-03, provided in ASTM D6348-03 Annex A5</p> <p>CO: Method 10 of 40 CFR part 60, appendix A-4, ASTM Method D6522-00 (2005), Method 320 of 40 CFR part 63, appendix A, or ASTM D6348-03</p>

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>40 CFR 63.6612(b)(1-4) A.A.C. R18-2-1101.B.81</p>	<p>An owner or operator is not required to conduct an initial performance test on a unit for which a performance test has been previously conducted, but the test must meet all of the conditions described in paragraphs (b)(1) through (4) of this section.</p> <p>(1) The test must have been conducted using the same methods specified in this subpart, and these methods must have been followed correctly.</p> <p>(2) The test must not be older than 2 years.</p> <p>(3) The test must be reviewed and accepted by the Administrator.</p> <p>(4) Either no process or equipment changes must have been made since the test was performed, or the owner or operator must be able to demonstrate that the results of the performance test, with or without adjustments, reliably demonstrate compliance despite process or equipment changes.</p>	<p>Because this engine is already permitted by the state of Utah it is possible that the initial source will be completed prior to the unit being moved to AZ. If so, the initial test will not apply as part of this permit application.</p>
<p>40 CFR 63.6615 (Table 3 Entry 5) A.A.C. R18-2-1101.B.81</p>	<p>Must comply with the emission limitations and operating limitations, you must conduct subsequent performance tests as specified in Table 3 of this subpart</p> <p>Conduct subsequent performance tests every 8,760 hours or 3 years, whichever comes first</p>	<p>Perform subsequent test by applying appropriate EPA methods</p>
<p>40 CFR 63.6620 A.A.C. R18-2-1101.B.81</p>	<p>All performance tests must comply with Tables 3 and 4 (see above). Each test must consist of three 1-hr separate runs.</p>	<p>All tests will be performed consistent with requirements of the subpart</p>

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
40 CFR 63.6625(g) A.A.C. R18-2-1101.B.81	<p>Install a closed crankcase ventilation system that prevents crankcase emissions from being emitted to the atmosphere, OR</p> <p>Install an open crankcase filtration emission control system that reduces emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates and metals</p>	The engine will be equipped with the appropriate crankcase ventilation system
40 CFR 63.6625(h) A.A.C. R18-2-1101.B.81	Minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	O&M plans; facility procedures; operation inspection, and operation and maintenance records.
40 CFR 63.6635(a-c) A.A.C. R18-2-1101.B.81	<p>Must comply with emission and operating limitations, you must monitor and collect data according to this section.</p> <p>Except for monitor malfunctions, associated repairs, required performance evaluations, and required quality assurance or control activities, you must monitor continuously at all times that the stationary RICE is operating. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.</p> <p>You may not use data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities in data averages and calculations used to report emission or operating levels. You must, however, use all the valid data collected during all other periods.</p>	Continuous monitoring will be maintained via a CPMS as described in previous sections of the subpart

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>40 CFR 63.6640(a-b) (Table 6, Entry 10) A.A.C. R18-2-1101.B.81</p>	<p>Demonstrate continuous compliance by:</p> <ul style="list-style-type: none"> • Conducting performance tests every 8,760 hours or 3 years, whichever comes first, for CO or formaldehyde, as appropriate, to demonstrate that the required CO or formaldehyde, as appropriate, percent reduction is achieved or that your emissions remain at or below the CO or formaldehyde concentration limit; and • Collecting the catalyst inlet temperature data according to § 63.6625(b); and • Reducing these data to 4-hour rolling averages; and • Maintaining the 4-hour rolling averages within the operating limitations for the catalyst inlet temperature; and • Measuring the pressure drop across the catalyst once per month and demonstrating that the pressure drop across the catalyst is within the operating limitation established during the performance test. 	<p>O&M plans; manufacturers' written emission-related instructions; maintenance plan; facility procedures; operation and maintenance records.</p>

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
<p>40 CFR 63.6645(f, g, h(2)) A.A.C. R18-2-1101.B.81</p>	<p>Required to submit an Initial Notification but are otherwise not affected by the requirements of this subpart, in accordance with §63.6590(b), your notification should include the information in §63.9(b)(2)(i) through (v), and a statement that your stationary RICE has no additional requirements and explain the basis of the exclusion (for example, that it operates exclusively as an emergency stationary RICE if it has a site rating of more than 500 brake HP located at a major source of HAP emissions).</p> <p>Required to conduct a performance test, you must submit a Notification of Intent to conduct a performance test at least 60 days before the performance test is scheduled to begin as required in §63.7(b)(1).</p> <p>(h) If you are required to conduct a performance test or other initial compliance demonstration as specified in Tables 4 and 5 to this subpart, you must submit a Notification of Compliance Status according to §63.9(h)(2)(ii).</p> <p>(2) For each initial compliance demonstration required in Table 5 to this subpart that includes a performance test conducted according to the requirements in Table 3 to this subpart, you must submit the Notification of Compliance Status, including the performance test results, before the close of business on the 60th day following the completion of the performance test according to §63.10(d)(2).</p>	<p>An initial notification was submitted to UDAQ in 2012. The initial performance test notification will be submitted to UDAQ or ADEQ as appropriate within the 60-day timeframe. The initial compliance status notification will also be made.</p>

Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
40 CFR 63.6650(a) (Table 7, Entry 1) 40 CFR 63.6650(h) A.A.C. R18-2-1101.B.81	All reports that are semiannual compliance are required to cover January 1 st through June 30 th and July 1 st through December 31 st . Each must be postmarked by July 31 st and January 31 st . All annual reports are required to cover January 1 st through December 31 st and postmarked by January 31 st .	Records of semi-annual and annual reports.

<p>40 CFR 63.6655(a, b and d) A.A.C. R18-2-1101.B.81</p>	<p>(a) If you must comply with the emission and operating limitations, you must keep the records described in paragraphs (a)(1) through (a)(5), (b)(1) through (b)(3) and (c) of this section.</p> <p>(1) A copy of each notification and report that you submitted to comply with this subpart, including all documentation supporting any Initial Notification or Notification of Compliance Status that you submitted, according to the requirement in §63.10(b)(2)(xiv).</p> <p>(2) Records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control and monitoring equipment.</p> <p>(3) Records of performance tests and performance evaluations as required in §63.10(b)(2)(viii).</p> <p>(4) Records of all required maintenance performed on the air pollution control and monitoring equipment.</p> <p>(5) Records of actions taken during periods of malfunction to minimize emissions in accordance with §63.6605(b), including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.</p> <p>(b) For each CEMS or CPMS, you must keep the records listed in paragraphs (b)(1) through (3) of this section.</p> <p>(1) Records described in §63.10(b)(2)(vi) through (xi).</p> <p>(2) Previous (i.e., superseded) versions of the performance evaluation plan as required in §63.8(d)(3).</p> <p>(3) Requests for alternatives to the relative accuracy test for CEMS or CPMS as required in §63.8(f)(6)(i), if applicable.</p> <p>(d) You must keep the records required in Table 6 of this subpart to show continuous compliance with each emission or operating limitation that applies to you.</p>	<p>O&M plans; facility procedures; records of operation and maintenance.</p>
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Table 6.5 Applicable Regulatory Requirements of A.A.C. R18-2-1101.B.81 and 40 CFR 63 Subpart ZZZZ (Existing Non-Emergency CI Engines) and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
40 CFR 63.6660(a) A.A.C. R18-2-1101.B.81	Records must be made and kept in a form suitable and readily available for expeditious review according to 40 CFR 63.10(b)(1).	Records retention policy.
40 CFR 63.6660(b) A.A.C. R18-2-1101.B.81	As specified in 40 CFR 63.10(b)(1), keep each record for 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record.	Records retention policy.
40 CFR 63.6660(c) A.A.C. R18-2-1101.B.81	Keep each record readily accessible in hard copy or electronic form for at least 5 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record, according to 40 CFR 63.10(b)(1).	Records retention policy.
40 CFR 63.6665 A.A.C. R18-2-1101.B.81	Comply with the General Provisions as specified in Table 8 of 40 CFR 63 Subpart ZZZZ.	Facility procedure; records review.

7 INSIGNIFICANT AND TRIVIAL ACTIVITY INFORMATION

The proposed insignificant activities associated with the Garkane facility are presented the two 1,500 gallons diesel tanks. Pursuant to A.A.C. R18-2-304.F.8, insignificant activities shall be listed in a permit application, but the application need not provide emissions data, except as requested by ADEQ following submittal of the application. Therefore, any emissions from the tanks are not considered in this application.

8 COMPLIANCE SCHEDULE

At the time of this application's submittal, Garkane is in compliance with all applicable requirements and will continue to comply with such requirements. Consequently, a compliance schedule is not required.

9 MINOR NEW SOURCE REVIEW (NSR) APPLICABILITY DETERMINATION

According to A.A.C. R18-2-334.A.2, minor NSR applies to:

- a new stationary source subject to this Section, if the source will have the potential to emit that pollutant at an amount equal to or greater than the permitting exemption threshold.

Garkane is a new source. However, the potential to emit emissions with the proposed hourly limit and control equipment (oxidation catalyst and SCR) are below the permitting exemption threshold. Therefore, minor NSR does not apply.

APPENDIX A STANDARD CLASS II PERMIT APPLICATION FORM

APPENDIX B EQUIPMENT LIST

Equipment List

Type of Equipment	Maximum Rated Capacity [1]	Make	Model	Serial Number	Date of Manufacture	Equipment ID Number
IC Engine	2,593 hp	Caterpillar	3516B	1HZ01203	June 28, 2001	IC1

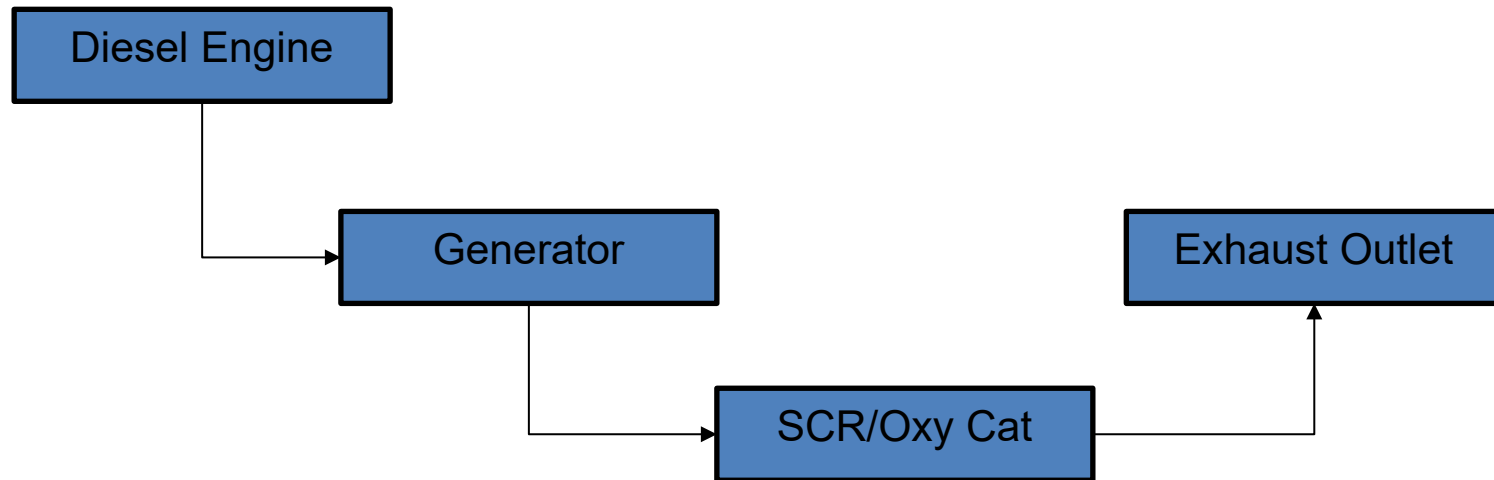
APPENDIX C EMISSION SOURCE FORM

Emission Source Form

Emission Point		Regulated Air Pollutant Name	PTE	
Number	Name		lbs/hr	tons/yr
1	IC Engine	PM2.5/10	0.11	0.26
1	IC Engine	NOx	2.86	6.43
1	IC Engine	CO	3.26	7.33
1	IC Engine	VOC	0.74	1.67
1	IC Engine	SO ₂	0.03	0.07
1	IC Engine	CO _{2e}	3012	6777
1	IC Engine	Total HAPs	2.86E-02	6.43E-02

APPENDIX D PROCESS FLOW DIAGRAMS

Figure D.1 Diesel ICE Flow Diagram



APPENDIX E CALCULATION METHODOLOGY

E.1 INTRODUCTION

The methodology used to calculate the emission rates presented in Section 4 and Appendices C, F, and G of this application is explained in the following sections.

E.2 DIESEL NON-EMERGENCY ENGINES

E.2.1 Process Rates

The annual and hourly process rates for diesel non-emergency engines are based on power ratings (capacity) and hours of operation. The annual and hourly process rates for diesel non-emergency engines and a description of how they were determined are presented in Table E.1.

E.2.2 Emission Factors

The type of fuel burned by the engines is presented in Table E.1 along with identification of which of the following emission factors are used to calculate emissions.

E.2.2.1 Diesel Non-Emergency Generator CAT 3516B (2,593 hp engine)

Uncontrolled PM, CO, NO_x, and VOC emissions from the Diesel Non-Emergency Generator CAT 3516B are calculated using manufacturer's information. Uncontrolled PM₁₀ and PM_{2.5} emissions are assumed to equal PM emissions as a worst-case emission estimate.

Uncontrolled SO₂ and HAP emissions are calculated assuming AP-42, Section 3.4 Large Stationary Diesel Engines. The Garkane facility uses ultra-low sulfur diesel fuel, which has a maximum sulfur content of 0.0015%. Uncontrolled CO₂, CH₄, and N₂O emissions are calculated using the global warming potential factors from 40 CFR 98 Tables C-1 and C-2 for distillate fuel oil No. 2.

Controlled PM, CO, NO_x and VOC emissions are calculated from Safety Power (supplier/manufacturer of the SCR and OC). The factors are 0.02, 0.57, 0.50 and 0.13 g/hp-hr, respectively.

E.2.3 Control Efficiencies

The control methods and corresponding control efficiency factors for diesel non-emergency engines are presented in Table E.1.

EMISSION INVENTORY TABLES FOR POTENTIAL EMISSION CALCULATIONS

Table E.1 Controlled and Uncontrolled Emission Factors and Total Emissions for CAT 3516B Engine

Pollutant	Engine Horsepower (hp)	Total Annual Operating Hours	Uncontrolled Tier 1 Emission Factor* (g/hp- hr)	Controlled Emission Factor (g/hp-hr)**	Controlled (lb/hr)	Controlled (tons/yr)
NOx	2,593	4,500	6.87	0.50	2.86	6.43
CO			8.51	0.57	3.26	7.33
PM10			0.40	0.02	0.11	0.26
PM2.5			0.40	0.02	0.11	0.26
VOC			0.97	0.13	0.74	1.67
SO ₂			1.21E-05	1.21E-05	0.03	0.07
CO ₂			1.16	1.16	3007.88	6,767.73
CH ₄			6.35E-05	6.35E-05	0.16	0.37
CO _{2e}					3011.99	6,776.98

* Cat 3516B Tier 1 Certification Factor or AP-42 Table 3.4-1 for SO₂, CO₂ and CH₄ (lb/hp-hr). CH₄ is 9% of TOC per footnote f

** All emissions but SO₂ for from Safety Power documentation

APPENDIX F ELECTRONIC COPY OF EMISSION CALCULATIONS

Table F.1 Applicability Check

Pollutant	Engine Horsepower (hp)	Uncontrolled Emission Factor (lb/hp-hr)	Controlled Emission Factor (lb/hp-hr)	Maximum Capacity to Emit @ 8,760 hr/yr (tpy)	Maximum Capacity to Emit with Limits 1 (4,500 hr/yr only) (tpy)	Maximum Capacity to Emit with Limits 2 (SCR and 4,500 hr/yr) (tpy)	Major Source Thresholds (tpy)	Significant Levels (tpy)	Permitting Exemption Thresholds (tpy)
NOx	2,593	0.015	0.0011	171.91	88.31	6.43	100	40	20
CO	2,593	0.019	0.0013	213.02	109.43	7.33	100	100	50
PM10	2,593	0.00089	0.00004	10.09	5.18	0.26	100	15	7.5
PM2.5	2,593	0.00089	0.00004	10.09	5.18	0.26	100	10	5
VOC	2,593	0.0021	0.00029	24.29	12.48	1.67	100	40	20
SO2	2,593	0.000012	0.000012	0.14	0.07	0.07	100	40	20
HAPs	2,593	0.000011	0.000011	0.13	0.06	0.06	10/25	0.6 (Pb)	0.3 (Pb)

Because Maximum Capacity to Emit @ 8,760 hr/yr > Permitting Exemption Thresholds, some type of permit/registration is needed; not exempt.

Because Maximum Capacity to Emit with Limits 1 > Significant Levels, registration cannot be used.

Because Maximum Capacity to Emit with Limits 2 (i.e., PTE) < Major Source Thresholds, a Class II permit can be obtained.

Because Maximum Capacity to Emit with Limits 2 < Permitting Exemption Thresholds, minor NSR is not triggered.

APPENDIX G APPLICATION ADMINISTRATIVE COMPLETENESS CHECKLIST

Requirement		Meets Requirement?			Comment
		Yes	No	N/A	
1.	Has the standard application form been completed?	X			See Appendix A.
2.	Has the responsible official signed the standard application form?	X			See Appendix A.
3.	Has a process description been provided?	X			See Section 2.1.
4.	Are the facility's emissions documented with all appropriate supporting information?	X			See Section 4 and Appendices C, E, and F.
5.	Is the facility subject to Minor NSR requirements? [If the answer is "Yes," answer 6a, 6b, and 6c, as applicable. If the answer is "No," skip to 7.]			X	See Section 9.
6.a	If the facility chooses to implement RACT, is the RACT determination included for the affected pollutants for all affected emission units?			X	The facility is not subject to minor NSR requirements.
6.b	If the facility chooses to demonstrate compliance with NAAQS by screen modeling, is the modeling analysis included?				
6.c	If refined modeling has been conducted, is a comprehensive modeling report along with all modeling files included?				
7.	Does the application include an equipment list with the type, name, make, model, serial number, maximum rated capacity, and date of manufacture?	X			See Appendix B.
8.	Does the application include an identification and description of pollution controls? (if applicable)	X			See Section 3.
9.	For any application component claimed as confidential, are the requirements of A.R.S. 49-432 and A.A.C. R18-2-305 addressed?			X	Not applicable for this application
10.	For any current non-compliance issue, is a compliance schedule attached?			X	Not applicable for this application
11.	For minor permit revision that will make a modification upon submittal of application, has a suggested draft permit been attached?			X	Not applicable for this application

APPENDIX H ENGINE MANUFACTURER SPECIFICATIONS

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER U-R-1-136

Relating to Certification of New Off-Road Compression-Ignition Equipment Engines

CATERPILLAR, INC.

Pursuant to the authority vested in the Air Resources Board (Board) by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-9;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engine and exhaust emission control system produced by the manufacturer are certified as described below for use in off-road equipment:

Model Year: 2001

Typical Equipment Usage: Loader, Pump, Generator and Other Industrial Equipment

Fuel Type: Diesel

<u>Engine Family</u>	Engine Displacement (liters)	Useful Life (hours)	Exhaust Emission Control Systems and Special Features
1CPXL78.1ERK	69.0 and 78.1	8000	Direct Diesel Injection Turbocharger Engine Control Module Charge Air Cooler

Engine models and codes are listed on attachments. Production engines shall be in all material respects the same as those for which certification is granted.

The exhaust emission certification standards and certification values for hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter (PM) (units are expressed in grams per kilowatt-hour (g/kw-hr)), and the opacity-of-smoke certification standards and certification values in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family are as follows (Title 13, California Code of Regulations, Section 2423, as amended by Board approval on January 28, 2000):

<u>Engine Power Rating (kw)</u>	<u>Emission Standard Category</u>		<u>Exhaust Emissions (g/kw-hr)</u>				<u>Smoke Opacity (%)</u>		
			<u>HC</u>	<u>CO</u>	<u>NOx</u>	<u>PM</u>	<u>Accel</u>	<u>Lug</u>	<u>Peak</u>
560<KW	Tier 1	Standard	1.3	11.4	9.2	0.54	20	15	50
		Certification	0.4	1.2	8.3	0.13	9	2	20

BE IT FURTHER RESOLVED: That, at the request of the manufacturer, the listed engine models are **conditionally certified** to, and shall be required to comply with, all amendments to Title 13, California Code of Regulations, Sections 2420 through 2427 adopted by the Board on January 28, 2000 at its hearing "TO CONSIDER AMENDMENTS TO OFF-ROAD COMPRESSION-IGNITION ENGINE REGULATIONS: 2000 AND LATER EMISSION STANDARDS, COMPLIANCE REQUIREMENTS AND TEST PROCEDURES." The listed engine models comply with all such amendments, including, but not limited to:


- the amended "Emission Control Labels—1996 and Later Off-Road Compression-Ignition Engines" (Title 13, California Code of Regulations, Section 2424) for the aforementioned model year;
- the Board's amended emission control system warranty provisions (Title 13, California Code of Regulations, Sections 2425 and 2426) for the listed engine models, as demonstrated by materials submitted by the manufacturer; and
- new California requirements for the Selective Enforcement Audit (SEA) for the listed engine models, as demonstrated by the manufacturer's submission of materials.

BE IT FURTHER RESOLVED: That the conditional certification described in the paragraph above is conditioned on the amendments being approved by the California Office of Administrative Law (OAL) pursuant to Government Code Section 11349.3, and where necessary, authorized by the Administrator of the U. S. Environmental Protection Agency (U.S. EPA) pursuant to Section 209(e)(2) of the Federal Clean Air Act. In the event that the OAL disapproves the amendments or the U.S. EPA decides not to authorize them, the ARB shall notify the manufacturer that the listed engine models must comply with the "California Exhaust Emission Standards and Test Procedures for 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines" (Title 13, California Code of Regulations, Sections 2420 through 2427) adopted on May 12, 1993, as applicable. Failure to demonstrate compliance within 45 days after notification by the Air Resources Board shall be cause for the Board to revoke the Executive Order and deem the listed engine models uncertified.

The conditional certification described herein is not conditioned on further U.S. EPA action on amendments determined by the Board to be within the scope of an existing U.S. EPA authorization.

Engines certified under this Executive Order must conform to the above requirements under Title 13, California Code of Regulations, Chapter 9, Article 4, and all other applicable California emission laws and regulations

Executed at El Monte, California this 21st day of December 2000.


R. B. Summerfield, Chief
Mobile Source Operations Division

ATTACHMENT

Engine Model Summary Form

Manufacturer: Caterpillar Inc.

Engine category: Nonroad CI

EPA Engine Family: 1CPXL78.1ERK

Mfr Family Name:

Process Code: New Submission

U-R-1-136

1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
1	3516	3230@1800	690	1115	9419@1800	N/A	N/A	EM,DI,TC,ECM
2	3516	2300@1750	520	817	8235@1300	624	728	EM,DI,TC,ECM
3	3516	1900@1750	404	634	6837@1300	501	585	EM,DI,TC,ECM
4	3516	1379@1600	328	472	5692@1100	403	398	EM,DI,TC,ECM
5	3516	1655@1750	358	563	5952@1300	429	501	EM,DI,TC,ECM
6	3516	1648@1200	540	582	7208@1200	N/A	N/A	EM,DI,TC,ECM
7	3516	1855@1200	607	654	8111@1200	N/A	N/A	EM,DI,TC,ECM
8	3516	2034@1200	670	721	8897@1200	N/A	N/A	EM,DI,TC,ECM
9	3516	2374@1800	492	795	6920@1800	N/A	N/A	EM,DI,TC,ECM
10	3516	2628@1800	544	879	7663@1800	N/A	N/A	EM,DI,TC,ECM
11	3516	2876@1800	602	972	8386@1800	N/A	N/A	EM,DI,TC,ECM
12	3516	2316@1800	483	780	6752@1800	N/A	N/A	EM,DI,TC,ECM
13	3516	2534@1800	526	849	7389@1800	N/A	N/A	EM,DI,TC,ECM
14	3516	1855@1200	603	649	8111@1200	N/A	N/A	EM,DI,TC,ECM
15	3516	2549@1800	517	836	7433@1800	N/A	N/A	EM,DI,TC,ECM
16	3516	1855@1200	596	642	8111@1200	N/A	N/A	EM,DI,TC,ECM
17	3516	1855@1200	596	642	8111@1200	N/A	N/A	EM,DI,TC,ECM
18	3516	2300@1750	489	768	8235@1300	575	671	EM,DI,TC,ECM
19	3516	1900@1750	404	634	6837@1300	501	585	EM,DI,TC,ECM
20	3516	2000@1800	435	703	6749@1350	N/A	N/A	EM,DI,TC,ECM
21	3516	2100@1800	456	736	6749@1350	N/A	N/A	EM,DI,TC,ECM
22	3516	2200@1800	477	771	6749@1350	N/A	N/A	EM,DI,TC,ECM

EMISSIONS DATA [1HZ01203]**(1HZ01203)-ENGINE (4FN02339)-GENERATOR (BPD00745)-
GENSET****JUNE 27, 2021****For Help Desk Phone Numbers** [Click here](/tmi/tmihome/TMIContactInfo.htm)
(/tmi/tmihome/TMIContactInfo.htm)TMI Emissions Data Survey (<https://www.caterpillarsurveys.com/se.ashx?s=4F5AA3C87FC94347>)Emissions Certificates Search (<https://dealer.cat.com/en/products/standards-regulations/emissions-certificates.html>)

Engine Emissions Data

For Emissions / Certification feedback and questions, please submit a ticket via our ERC Request Portal
(<https://ercrequestspilotprogram.atlassian.net/servicedesk/customer/portal/2>)

This emission data is Caterpillar's best estimate for this rating. If actual emissions are required then an
emission test needs to be run on your engine.

Serial Number (Machine)	
Serial Number (Engine)	1HZ01203
Sales Model	3516
Regulatory Build Date	28-JUN-2001

As Shipped Data

Engine Arrangement Number	1889442
Certification Arrangement	
Test Spec Number	0K2944

Regulatory Status	EPA / CARB @ Constant Speed
Labeled Model Year	2001
EPA Family Code	1CPXL78.1ERK (https://cat-cert-repo-prod-cdn.azureedge.net/emission-certificates/archive/1CPXL78.1ERK.pdf?IKF3jUVH_IIGyWdABt0D6OD3hZI2sU1ldTqHmzthoSS9fCoo07aJOWIXLXXAr9E7)
EPA Emissions Level	EPA Tier 1
As-Shipped Flash File	2057002
CORR FL Power at RPM	2,934 HP (2,188.0 KW)1800 RPM
Advertised Power	2,628 HP 1,800RPM
Total Displacement	69.0 L

Disclaimer: The information provided has been compiled from third party sources and is accurate to the best of Caterpillar's knowledge. However, Caterpillar cannot guarantee the accuracy, completeness, or validity of the information and is not liable for any errors or omissions contained therein. All information provided should be independently verified and confirmed, including by examining the emissions label located on the engine.

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Current Date: 6/27/2021, 3:46:39 PM

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PERFORMANCE DATA [1HZ01203]

JUNE 27, 2021

(1HZ01203)-ENGINE (4FN02339)-GENERATOR (BPD00745)-GENSET

For Help Desk Phone Numbers [Click here](#)

Perf No: DM4683

Change Level: 02 ▾

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View PDF

SALES MODEL:	3516B	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
ENGINE POWER (BHP):	2,628	HERTZ:	60
GEN POWER WITH FAN (EKW):	1,825.0	FAN POWER (HP):	59.5
COMPRESSION RATIO:	14	ASPIRATION:	TA
RATING LEVEL:	PRIME	AFTERCOOLER TYPE:	SCAC
PUMP QUANTITY:	2	AFTERCOOLER CIRCUIT TYPE:	JW+OC, AC
FUEL TYPE:	DIESEL	AFTERCOOLER TEMP (F):	140
MANIFOLD TYPE:	DRY	JACKET WATER TEMP (F):	210.2
GOVERNOR TYPE:	ADEM3	TURBO CONFIGURATION:	PARALLEL
ELECTRONICS TYPE:	ADEM3	TURBO QUANTITY:	4
CAMSHAFT TYPE:	STANDARD	TURBOCHARGER MODEL:	GTA5518BN-56T-1.24
IGNITION TYPE:	CI	CERTIFICATION YEAR:	2001
INJECTOR TYPE:	EUI	CRANKCASE BLOWBY RATE (FT3/HR):	2,627.1
FUEL INJECTOR:	1504456	FUEL RATE (RATED RPM) NO LOAD (GAL/HR):	14.3
UNIT INJECTOR TIMING (IN):	64.34	PISTON SPD @ RATED ENG SPD (FT/MIN):	2,244.1
REF EXH STACK DIAMETER (IN):	12		
MAX OPERATING ALTITUDE (FT):	4,921		

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data [Top](#)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR
1,825.0	100	2,593	271	0.332	121.5
1,642.5	90	2,338	244	0.334	110.2
1,460.0	80	2,084	218	0.339	99.5
1,368.8	75	1,958	205	0.341	94.1
1,277.5	70	1,831	191	0.343	88.7
1,095.0	60	1,579	165	0.349	77.6
912.5	50	1,328	139	0.355	66.4
730.0	40	1,079	113	0.363	55.2
547.5	30	829	87	0.376	43.9
456.2	25	704	74	0.386	38.3
365.0	20	577	60	0.401	32.6
182.5	10	321	34	0.466	21.1

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	DEG F	IN-HG	DEG F
1,825.0	100	2,593	73.7	176.0	1,107.1	807.8	74	418.8
1,642.5	90	2,338	67.0	171.0	1,063.4	782.2	67	394.9
1,460.0	80	2,084	60.5	167.5	1,028.7	763.5	61	371.7
1,368.8	75	1,958	56.8	165.6	1,011.8	758.0	57	359.0
1,277.5	70	1,831	52.8	163.6	995.0	753.6	53	345.4
1,095.0	60	1,579	44.2	159.4	961.5	747.0	44	314.6

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
912.5	50	1,328	35.6	155.3	928.2	740.3	36	281.1
730.0	40	1,079	27.3	151.8	880.1	722.7	28	244.8
547.5	30	829	19.1	148.8	813.1	689.6	20	207.7
456.2	25	704	15.4	147.5	771.1	664.9	16	189.9
365.0	20	577	11.8	146.5	721.7	633.2	13	172.5
182.5	10	321	6.4	145.4	589.6	535.6	7	141.6

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
1,825.0	100	2,593	5,812.2	14,255.1	25,571.7	26,433.6	5,529.8	5,088.6
1,642.5	90	2,338	5,487.2	13,170.8	23,148.8	23,930.2	5,214.3	4,798.4
1,460.0	80	2,084	5,155.3	12,185.5	21,100.5	21,806.4	4,898.1	4,507.3
1,368.8	75	1,958	4,954.1	11,662.3	20,104.6	20,772.2	4,709.1	4,333.4
1,277.5	70	1,831	4,735.2	11,115.9	19,102.4	19,731.2	4,504.6	4,145.2
1,095.0	60	1,579	4,258.4	9,954.0	17,021.3	17,571.9	4,056.0	3,732.5
912.5	50	1,328	3,781.8	8,739.4	14,871.3	15,342.5	3,580.8	3,295.2
730.0	40	1,079	3,302.5	7,488.0	12,562.3	12,953.9	3,113.8	2,865.4
547.5	30	829	2,826.8	6,235.2	10,171.9	10,483.6	2,667.5	2,454.7
456.2	25	704	2,593.5	5,605.5	8,951.6	9,223.1	2,450.8	2,255.3
365.0	20	577	2,363.6	4,971.9	7,718.6	7,949.7	2,236.8	2,058.3
182.5	10	321	1,940.3	3,695.6	5,232.0	5,381.5	1,825.6	1,680.0

Heat Rejection Data [Top](#)

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
1,825.0	100	2,593	40,605	7,677	98,442	49,534	13,194	25,194	109,964	264,636	281,904
1,642.5	90	2,338	37,761	7,336	89,397	43,959	11,999	21,837	99,144	239,804	255,451
1,460.0	80	2,084	34,974	6,995	80,923	39,352	10,805	18,539	88,384	215,726	229,802
1,368.8	75	1,958	33,582	6,853	76,692	37,250	10,241	16,911	83,021	203,750	217,045
1,277.5	70	1,831	32,188	6,711	72,452	35,202	9,668	15,298	77,655	191,762	204,275
1,095.0	60	1,579	29,231	6,426	63,977	31,107	8,417	12,170	66,963	167,789	178,738
912.5	50	1,328	26,160	6,085	55,504	27,070	7,222	9,213	56,300	143,874	153,262
730.0	40	1,079	22,891	5,772	46,916	22,449	6,002	6,501	45,744	119,999	127,829
547.5	30	829	19,380	5,458	38,072	17,441	4,773	4,030	35,161	95,853	102,108
456.2	25	704	17,523	5,293	33,525	14,752	4,152	2,893	29,837	83,623	89,079
365.0	20	577	15,594	5,119	28,860	12,015	3,530	1,826	24,474	71,235	75,884
182.5	10	321	11,506	4,665	19,038	6,336	2,280	-49	13,600	45,864	48,856

Emissions Data [Top](#)

Units Filter

All Units

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN	ENGINE POWER	EKW BHP	1,825.0 2,593	1,368.8 1,958	912.5 1,328	456.2 704	182.5 321
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	19,913	11,098	6,674	3,582	2,545
TOTAL CO		G/HR	1,487	1,031	824	841	880
TOTAL HC		G/HR	331	329	260	182	176
TOTAL CO2		KG/HR	1,166	900	631	364	195
PART MATTER		G/HR	155.1	160.3	139.2	95.7	58.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,695.8	2,658.4	2,265.1	2,108.4	2,733.8

6/27/2021

MAX Performance Data Display

GENSET POWER WITH FAN ENGINE POWER PERCENT LOAD		EKW BHP %	1,825.0 2,593 100	1,368.8 1,958 75	912.5 1,328 50	456.2 704 25	182.5 321 10
TOTAL CO	(CORR 5% O2)	MG/NM3	278.2	248.5	281.8	499.7	972.9
TOTAL HC	(CORR 5% O2)	MG/NM3	61.5	78.8	88.3	107.2	189.0
PART MATTER	(CORR 5% O2)	MG/NM3	28.8	38.4	47.2	56.3	62.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,801	1,296	1,103	1,028	1,338
TOTAL CO	(CORR 5% O2)	PPM	223	199	225	400	778
TOTAL HC	(CORR 5% O2)	PPM	99	127	143	173	307
TOTAL NOX (AS NO2)		G/HP-HR	7.68	5.67	5.03	5.09	7.94
TOTAL CO		G/HP-HR	0.57	0.53	0.62	1.19	2.74
TOTAL HC		G/HP-HR	0.13	0.17	0.20	0.26	0.55
PART MATTER		G/HP-HR	0.06	0.08	0.10	0.14	0.18
TOTAL NOX (AS NO2)		LB/HR	43.90	24.47	14.71	7.90	5.61
TOTAL CO		LB/HR	3.28	2.27	1.82	1.85	1.94
TOTAL HC		LB/HR	0.73	0.73	0.57	0.40	0.39
TOTAL CO2		LB/HR	2,571	1,984	1,392	803	429
PART MATTER		LB/HR	0.34	0.35	0.31	0.21	0.13
OXYGEN IN EXH		%	11.0	12.0	12.7	14.0	15.9
DRY SMOKE OPACITY		%	1.8	2.2	3.0	2.6	2.0
BOSCH SMOKE NUMBER			0.61	0.76	1.11	0.95	0.66

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER PERCENT LOAD		EKW BHP %	1,825.0 2,593 100	1,368.8 1,958 75	912.5 1,328 50	456.2 704 25	182.5 321 10
TOTAL NOX (AS NO2)		G/HR	23,895	13,317	8,009	4,298	3,054
TOTAL CO		G/HR	2,676	1,857	1,483	1,513	1,584
TOTAL HC		G/HR	440	438	346	242	234
PART MATTER		G/HR	217.1	224.4	194.9	134.0	81.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	4,435.0	3,190.0	2,718.1	2,530.1	3,280.6
TOTAL CO	(CORR 5% O2)	MG/NM3	500.8	447.2	507.2	899.4	1,751.2
TOTAL HC	(CORR 5% O2)	MG/NM3	81.8	104.8	117.4	142.6	251.3
PART MATTER	(CORR 5% O2)	MG/NM3	40.3	53.8	66.1	78.8	87.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	2,161	1,555	1,324	1,234	1,605
TOTAL CO	(CORR 5% O2)	PPM	401	358	406	720	1,401
TOTAL HC	(CORR 5% O2)	PPM	132	169	190	230	409
TOTAL NOX (AS NO2)		G/HP-HR	9.22	6.80	6.03	6.11	9.52
TOTAL CO		G/HP-HR	1.03	0.95	1.12	2.15	4.94
TOTAL HC		G/HP-HR	0.17	0.22	0.26	0.34	0.73
PART MATTER		G/HP-HR	0.08	0.11	0.15	0.19	0.26
TOTAL NOX (AS NO2)		LB/HR	52.68	29.36	17.66	9.48	6.73
TOTAL CO		LB/HR	5.90	4.09	3.27	3.34	3.49
TOTAL HC		LB/HR	0.97	0.96	0.76	0.53	0.52
PART MATTER		LB/HR	0.48	0.49	0.43	0.30	0.18

Regulatory Information
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EPA TIER 1		2000 - 2005			
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 89 SUBPART D AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. *THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.					
Locality U.S. (INCL CALIF)	Agency EPA	Regulation NON-ROAD	Tier/Stage TIER 1	Max Limits - G/BKW - HR CO: 11.4 NOX: 9.2 HC: 1.3 PM: 0.50	

Altitude Derate Data
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STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)													
AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,497	2,391	2,628
1,000	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,575	2,470	2,365	2,628
2,000	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,523	2,418	2,286	2,628
3,000	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,575	2,444	2,339	2,234	2,628
4,000	2,628	2,628	2,628	2,628	2,628	2,628	2,617	2,570	2,497	2,365	2,260	2,155	2,628

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
5,000	2,621	2,621	2,621	2,621	2,617	2,568	2,521	2,476	2,418	2,286	2,181	2,050	2,621
6,000	2,538	2,538	2,538	2,538	2,520	2,473	2,428	2,385	2,313	2,208	2,076	1,971	2,538
7,000	2,458	2,458	2,458	2,458	2,426	2,381	2,338	2,296	2,208	2,102	1,997	1,892	2,458
8,000	2,381	2,381	2,381	2,381	2,336	2,292	2,251	2,210	2,102	1,997	1,892	1,708	2,381
9,000	2,307	2,307	2,307	2,291	2,248	2,206	2,166	2,102	1,997	1,892	1,734	1,498	2,307
10,000	2,236	2,236	2,236	2,204	2,162	2,122	2,084	1,997	1,892	1,813	1,524	1,314	2,236
11,000	2,167	2,167	2,161	2,120	2,080	2,041	1,918	1,787	1,656	1,524	1,314	1,183	2,167
12,000	2,101	2,101	2,078	2,038	1,997	1,866	1,734	1,603	1,472	1,314	1,183	1,051	2,101
13,000	2,024	2,024	1,997	1,945	1,813	1,682	1,524	1,393	1,261	1,183	1,051	946	2,024
14,000	1,971	1,958	1,866	1,734	1,603	1,472	1,340	1,235	1,130	1,051	946	841	1,970
15,000	1,892	1,813	1,682	1,551	1,419	1,288	1,183	1,104	1,025	946	867	762	1,892

Cross Reference [Top](#)

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K2955	GG0005	1979039	GS034	-	1HZ02896	
0K5841	GG0218	1979039	GS034	-	1HZ02896	
0K2955	GG0005	1979039	NAP	NAP		

General Notes [Top](#)

DM4683 - 02
SOUND PRESSURE DATA FOR THIS RATING CAN BE FOUND IN PERFORMANCE NUMBER - DM8779

Supplementary Data [Top](#)

Type	Classification	Performance Number
SOUND	SOUND PRESSURE	DM8779

Performance Parameter Reference [Top](#)

Parameters Reference: DM9600 - 12
PERFORMANCE DEFINITIONS
PERFORMANCE DEFINITIONS DM9600
APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.
PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10% Heat Rejection values based on using treated water. Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications. On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed. These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set. Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet. Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS

1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 07/10/19



clean essential energy

DESIGN PARAMETERS

The design of the Safety Power emissions reduction system is based on the following conditions.

Note: NO_x is calculated as NO₂.

Table 1 – Engine Data

Engine Type:	CAT 3516B
Application	Stand-by
Engine Power	1825 ekW
Exhaust Temperature	808 °F
Design Exhaust Flow Rate	14255 (CFM)
Fuel Type	Diesel

Table 2 – Emissions Data at Full Engine Load

Engine Option	Emissions	Catalyst Inlet	Emissions Requirement	Catalyst Outlet
CAT 3516B	NO _x (g/HP-h)	7.68	0.50	0.50
	CO (g/HP-h)	0.57	2.60	0.57
	NMHC (g/HP-h)	0.13	0.14	0.13
	PM (g/HP-h)	0.06	0.020	0.020

Notes: (1) The EPA does not treat methane and ethane as VOC's. Safety Power can achieve a stated reduction of VOC's based on the EPA definition assuming that the VOC's manifest themselves as propene. (2) all emissions reductions are based on an average at steady state using SCAQMD method 100.1 for NO_x and SCAQMD/EPA methods 25.1/25.3 for CO and VOC's or mutually agreed test method approved in writing. (3) if NMHC/VOC data isn't provided 0.6 g/hp-hr is to be assumed (unless otherwise stated).

Table 3 – SCR System Data

Engine Option	CAT 3516B
Max. Ammonia Slip @ 15% O ₂	8 ppm
Urea Consumption - 32.5% solution (+/- 15%)	9.3 USG/hr
SCR Pressure Loss	19.5" WC
SCR Inlet/Outlet ANSI Flange Inches	28/28

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