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Notice of Construction (NOC) Application

Rocky Reach Emergency Generator

Prepared for

Chelan County Public Utility District No. 1

P.O. Box 1231

Wenatchee, WA 98807-1231

Prepared by

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ACRONYMS AND ABBREVIATIONS

ASIL	Acceptable Source Impact Level
BACT	Best Available Control Technology
CCPUD1	Chelan County Public Utility District No.1
CFR	Code of Federal Regulations
CI	Compression Ignition
CO ₂ e	carbon dioxide equivalent
DEEP	Diesel engine exhaust particulate
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
Facility	Rocky Reach Dam
GHGs	greenhouse gas emissions
HAPs	hazardous air pollutants
LAER	Lowest Achievable Emission Rate
NAAQS	National Ambient Air Quality Standards
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NMHC	Non-Methane Hydrocarbons
NOC	Notice of Construction
NSPS	New Source Performance Standards
NSR	New Source Review
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
RACT	Reasonably Achievable Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
RICE	Reciprocating Internal Combustion Engine
SEPA	State Environmental Protection Act
SIL	Significant Impact Level
SQER	small quantity emission rate
TAPs	Toxic Air Pollutants
tBACT	Best Available Control Technology for Air Toxics
tpy	Tons per year
ULSD	Ultra Low Sulfur Diesel
USEPA	U.S. Environmental Protection Agency (EPA)
VOC	volatile organic compound
WAC	Washington Administrative Code

1. INTRODUCTION

Chelan County Public Utility District No.1 (CCPUD1) is submitting this Notice of Construction (NOC) application to install a new 750 kilowatt (kW) diesel-fired emergency generator at Rocky Reach Dam (“Facility”), located in Wenatchee, Washington.

CCPUD1 operates the Facility located at approximately 47.53161° latitude, -120.29951° longitude within Township 24 N, Range 20 E, adjacent to U.S. Route 97 Alt. state highway in Washington that runs along the west bank of the Columbia River between Wenatchee and Chelan. The Permittee is classified as a natural minor source with regard to the applicability thresholds for Title V of the federal Clean Air Act.

The Facility includes one existing 300-kW diesel-fired emergency generator that is exempt from Notice of Construction permitting. The existing generator provides emergency (backup) power for Station Service Bus 5, that is used to control the following powerhouse units: dewatering pumps, feeder breakers, exciters and associated equipment, a control center and data center. The existing diesel generator is located on the northeastern end of the Facility. The existing diesel generator is summarized in Table 1-1.

Table 1-1. Existing Equipment for Rocky Reach Emergency Generator Project

Equipment	Manufacturer/ Model	Engine Rating (kWm)
Emergency Generator	Cummins	300

CCPUD1 plans to commence work on the proposed project to install the new diesel power emergency generator once the NOC approval order is issued. The new emergency generator will be used to provide emergency backup power to Station Service Bus 2 and will be located towards the southwestern end of the Facility, closer to the Rocky Reach Visitor Center and entrance. After installation of the proposed new emergency generator, the existing 300 kW emergency generator will be used to provide emergency backup power to the control center and data center only.

Key components of this NOC application are organized as follows:

- Section 2 Projects and Equipment Descriptions
- Section 3 Emission Calculations
- Section 4 Regulatory Analysis
- Section 5 Best Available Control Technology (BACT) and tBACT Review
- Section 6 Ambient Air Quality & Toxic Analysis

2. PROJECT AND EQUIPMENT DESCRIPTION

2.1 Project Description

Chelan County Public Utility District No.1 (CCPUD1) currently operates a hydroelectric dam that generates power within the boundaries of Wenatchee, WA. CCPUD1 plans to install a new diesel power emergency generator to generate additional electric power at the existing Rocky Reach Dam site. The site currently only has one existing 300 kW Cummins diesel emergency generator that provides backup power at the Facility.

2.2 Equipment Description

The Rocky Reach Emergency Generator Project includes the installation of a new emergency diesel generator with the following specifications in Table 2-1.

Table 2-1. New Equipment for Rocky Reach Emergency Generator Project

Equipment	Manufacturer/ Model	Engine Rating (kWm)
Emergency Generator	Caterpillar C18, In-line 6, 4-cycle diesel	750

The new emergency generator is a Tier 2 engine certified by USEPA to comply with Tier 2 emission standards that meet federal emission standards. Manufacturer specifications are provided in Appendix E.

3. EMISSION CALCULATIONS

Air pollutant emissions from the new emergency generator include nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), volatile organic compounds (VOCs), particulate matter (PM), and toxic air pollutants (TAP), as listed in WAC 173-460-150.

Emission factors for criteria pollutants are calculated using general performance data for the Caterpillar C18 750 kW emergency generator. Particulate matter with aerodynamic diameter less than 10 microns (PM₁₀) and particulate matter with aerodynamic diameter less than 2.5 microns (PM_{2.5}) emission factors are assumed to be equivalent to PM emission factors. To account for condensable PM, the calculated PM emission factor is a sum of filterable (PM) and VOC emission factors. Non-methane hydrocarbons (NMHCs) are the major component of VOC and are conservatively used as the emission factor for VOC.

TAP emission rates are calculated from the maximum emission rate provided amongst AP-42 Chapter 3.3, Ventura County AB 2588 Combustion Emission Factors, and the California Air Resources Board Toxics Emission Factor database. Diesel engine exhaust particulate (DEEP) is a TAP and is assumed to have the same emission factor as filterable PM.

General performance data was reviewed to estimate maximum emissions at varying loading rates. Fuel consumption data was provided for 100%, 75%, 50%, 25%, and 10% loads.

Hourly and annual emission rates for the criteria pollutants and TAPs are calculated in pounds per hour (lb/hr) and tons per year (tpy) respectively. Since the proposed engine is an emergency generator, the annual emissions are based on 500 hours of annual operation. The emissions summary of the new diesel generator is provided in Table 3-1. Detailed emission calculations are provided in Appendix B. Additional emission factor references are provided in Appendix G.

Table 3-1. Emissions From Proposed Emergency Generator

Pollutant	Potential Emissions	
	Hourly (lb/hr)	Annual (tpy)
Criteria Pollutants		
NO _x	12.02	3.00
CO	0.49	0.12
SO ₂	0.01	2.82E-03
VOC	0.13	3.33E-02
PM/PM10/PM2.5	0.20	4.99E-02
CO ₂ e	1132.23	283.06
Hazardous Air Pollutants⁽¹⁾		
Benzene	1.75E-02	4.38E-03
Toluene	5.87E-03	1.47E-03
Xylene	2.25E-03	5.62E-04
1,3-Butadiene	1.15E-02	2.88E-03
Formaldehyde	9.15E-02	2.29E-02
Acetaldehyde	4.15E-02	1.04E-02
Acrolein	1.80E-03	4.49E-04
Naphthalene	1.69E-03	4.22E-04
Washington TAP		
Propylene	2.48E-02	6.19E-03
Benzo(a)anthracene	1.48E-05	3.71E-06
Chrysene	1.48E-05	3.71E-06
Benzo(b)fluoranthene	1.48E-05	3.71E-06
Benzo(k)fluoranthene	1.48E-05	3.71E-06
Benzo(a)pyrene	1.48E-05	3.71E-06
Diesel engine exhaust, particulate	0.07	1.66E-02
Indeno(1,2,3-cd)pyrene	1.48E-05	3.71E-06
Dibenz(a,h)anthracene	1.48E-05	3.71E-06
Nitrogen dioxide	12.02	3.00
Total HAPs		
Maximum Individual HAP	1.74E-01	4.34E-02
	9.15E-02	2.29E-02

¹Also WA TAPs

4. REGULATORY ANALYSIS

4.1 Federal

The Rocky Reach Dam is classified as a minor source based on its potential to emit.

4.1.1 New Source Performance Standards

New Source Performance Standards (NSPS) are nationally uniform standards applied to specific categories of stationary sources that are constructed, modified, or reconstructed after the standard was proposed. NSPS are found at 40 CFR Part 60. NSPS 40 CFR Part 60, Subpart IIII is applicable to the new diesel generator, as this unit is commencing construction of a stationary compression ignition (CI) reciprocating internal engine (RICE) after July 11, 2005 and manufactured after April 1, 2006.

4.1.1.1 40 CFR 60 Subpart IIII

NSPS 40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, is applicable to the new diesel emergency generator, as this unit is commencing construction of a stationary compression ignition (CI) reciprocating internal engine (RICE) after July 11, 2005 and manufactured after April 1, 2006. The requirements of this Subpart are outlined below.

- Engine must be EPA-certified to applicable Tier standards. §60.4205(b), §60.4211(c)
- Must use ULSD fuel (≤ 15 ppm sulfur). §60.4207(b)
- Engine must be installed and operated according to manufacturer specifications. §60.4211(a), (c)
- Must meet Subpart IIII emission standards for NO_x, PM, CO, and HC. §60.4205(b)
- Must comply with monitoring requirements (including meter verification). §60.4209
- Must maintain records and follow compliance procedures under §60.4211.

The new emergency generator is an engine certified by the manufacturer as compliant with USEPA Tier 2 emission standards and will use ultra-low sulfur diesel (ULSD) fuel that meets NSPS Subpart IIII requirements.

4.1.2 National Emissions Standards for Hazardous Air Pollutants (NESHAPS)

The National Emission Standards for Hazardous Air Pollutants (NESHAPS) regulations contained in 40 CFR Part 61 – 63 establish emission standards for certain source categories of HAP emissions. Ecology has adopted 40 CFR Part 63 and appendices by reference in WAC 173-400-075.

4.1.2.1 40 CFR 63 Subpart ZZZZ

The proposed new diesel emergency generator is subject to the requirements of 40 CFR 63, Subpart ZZZZ, *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*. Under Subpart ZZZZ, the engines are classified as new compression ignition engines. Per 40 CFR 63.6590(c), the engines meet the requirements of 40 CFR 63 Subpart

ZZZZ by meeting the requirements of 40 CFR 60 Subpart IIII and are not subject to any other requirements under Subpart ZZZZ.

4.2 Prevention of Significant Deterioration

The facility is in Chelan County, which is currently classified as an attainment area for all criteria pollutants, consideration for New Source Review (NSR) pollutants are evaluated for Prevention of Significant Deterioration (PSD) in lieu of Nonattainment NSR.

An emission source is subject to the Prevention of Significant Deterioration (PSD) permitting program under Washington Administrative Code (WAC) 173-400-110 if the new installation is either a major modification to an existing major source or is a major source by itself. The potential emissions of the proposed new emergency generator are well below PSD applicability thresholds for criteria air pollutants. Therefore, a PSD permit is not required for the proposed source.

4.3 Washington State New Source Review

New source review is required under WAC 173-400-110 for construction of new emissions units or modifications to existing units that have the potential to emit pollutants greater than the Washington NSR exemption levels show in Table 4-1.

4.3.1 Washington State NSR Permitting Levels

Projects in Washington are required to go through NOC permitting when emissions of one or more NSR-regulated pollutant exceeds the Washington State NSR Exemption levels. These levels are shown in Table 4-1.

Table 4-1. Washington NSR Exemption Levels

NSR Regulated Pollutant	Project Emissions (tpy)	WA NSR Exemption Level (tpy)
Carbon Monoxide	0.12	5.0
Nitrogen Oxides, NO _x	3.00	2.0
Particulate Matter, PM-10	4.99E-02	0.75
Particulate Matter, PM-2.5	4.99E-02	0.5
Total Suspended Particulates	4.99E-02	1.25
Sulfur Dioxide	2.82E-03	2.0
Volatile Organic Compounds	3.33E-02	2.0
Greenhouse Gases (CO ₂ e) (in metric tpy)	283	10,000

The projected emissions from the new generator are compared to their de minimis rates in Table 4-2 for criteria pollutant emissions and Table 4-3 for toxics emissions. Since emissions of NO_x, and emissions of nine TAPs exceed their de minimis rates, a NOC is required for this project.

Table 4-2. New Generator Criteria Pollutant Emissions Compared to De Minimis Rates

Pollutant	Emissions (tons/year)	Exemption Threshold Levels (tons/year)	Exceeds Threshold?
NO _x	3.00	2	YES
CO	0.12	5	NO
SO ₂	2.82E-03	2	NO
VOC	3.33E-02	2	NO
PM	4.99E-02	1.25	NO
PM ₁₀ ⁽¹⁾	4.99E-02	0.75	NO
PM _{2.5} ⁽¹⁾	4.99E-02	0.5	NO

¹PM = PM10 = PM2.5

Table 4-3. New Generator TAP Emissions Increases Compared to De Minimis Rates

Pollutant	WAC 173-460-150 SQER Averaging Period	Emissions (lb/Averaging Period)	De Minimis Rate (lb/Averaging period)	Emissions Increase > De Minimis?
Benzene	year	8.75	1	YES
Toluene	24-hr	1.41E-01	19	NO
Xylene	24-hr	5.39E-02	0.82	NO
1,3-Butadiene	year	5.76	0.27	YES
Formaldehyde	year	45.74	1.4	YES
Acetaldehyde	year	20.76	3	YES
Acrolein	24-hr	4.31E-02	0.0013	YES
Naphthalene	year	8.45E-01	0.24	YES
Propylene	24-hr	5.94E-01	11	NO
Benzo(a)anthracene	year	7.42E-03	0.045	NO
Chrysene	year	7.42E-03	0.45	NO
Benzo(b)fluoranthene	year	7.42E-03	0.045	NO
Benzo(k)fluoranthene	year	7.42E-03	0.045	NO
Benzo(a)pyrene	year	7.42E-03	0.0082	NO
Diesel engine exhaust, particulate	year	33.26	0.027	YES
Indeno(1,2,3-cd)pyrene	year	7.42E-03	0.045	NO
Dibenz(a,h)anthracene	year	7.42E-03	0.0041	YES
Nitrogen dioxide	1-hr	12.02	0.46	YES

4.3.2 Mandatory Greenhouse Gas Reporting

Stationary facilities with annual emissions of greenhouse gases equal to or greater than 25,000 MT may be subject to the annual reporting requirements of the USEPA's federal Greenhouse Gas Reporting Program (40 CFR Part 98). Stationary facilities with annual greenhouse gas emissions equal to or greater than 10,000 MT may be subject to reporting under Ecology's Greenhouse Gas Reporting rule (WAC 173-441). The post-project facility emissions will be less than 10,000 MT annually and therefore the facility is not subject to federal or state greenhouse gas reporting requirements.

4.3.3 State Environmental Protection Act (SEPA)

All projects required to obtain a permit prior to construction or an agency approval to proceed are subject to SEPA requirements. A SEPA checklist has been prepared for this project and is included with this NOC application as Appendix F.

5. BACT AND tBACT REVIEW PROCESS

Best Available Control Technology (BACT) is defined in Washington Administrative Code (WAC) 173-400-030(13) as “an emission limitation based on the maximum degree of reduction...from any new or modified stationary source...which the permitting authority, on a case-by-case basis...taking into account energy, environmental, and economic impacts and other costs...” Therefore, in Washington State, BACT is required not only for major new source review but also for minor new source review.

BACT is required for sources of criteria pollutants and tBACT is required for sources of Washington State toxic air pollutants (TAPs). In Washington State, all Federal HAPs are included in the state TAPs list. BACT/tBACT analysis is required for new sources of air emissions related to the proposed project. The regulated air pollutants for the proposed project are shown in Table 5-1.

Table 5-1. Pollutant Best Available Control Technology

Regulated Pollutant	BACT Applies?	tBACT Applies?
Particulate Matter (PM)	No	
VOCs	No	
NOx	Yes	
SO ₂	No	
CO	No	
State TAPs		Yes

For Rocky Reach Emergency Generator Project, the proposed new emergency generator will be an EPA Tier 2 compliant engine, which should be considered as BACT and tBACT and is consistent with similar determination by WA Ecology. The air pollutants of concern from the emergency generator are NOx, and WA TAPs. As TAP emissions consist of volatile organic compounds (VOC), VOC controls were reviewed for tBACT determinations.

A review of EPA’s RACT/BACT/LAER Clearinghouse (RBLC) for emergency generators with engine ratings ranging from 840 kW to 2500 kW indicates that compliance with 40 CFR Part 60, Subpart IIII is an applicable control for NOx and TAPs. For emergency stationary internal combustion engines, Subpart IIII requires Tier 2 certified nonroad emission standards under 40 CFR Part 1039, Appendix I. Furthermore, good combustion and operating practices, usage of low sulfur diesel fuel and limited hours of non-emergency operation were appropriate control measures for NOx and TAPs. The proposed new emergency generator has an engine rating of 750 kW, lower than those found in EPA’s RBLC.

Therefore, using a Tier 2 certified engine and operating according to manufacturer specifications constitutes the BACT/tBACT for the proposed emergency generator. The proposed emergency generator will also comply with requirements of 40 CFR Part 60 Subpart IIII.

6. AMBIENT AIR IMPACTS ANALYSIS

Ambient air impacts analyses are required for criteria pollutants and TAPs per WAC 173-400-113 and WAC 173-460-070 to ensure that emissions attributable to a new or modified source do not contribute to a violation of the National Ambient Air Quality Standard (NAAQS) for criteria pollutants or the Acceptable Source Impact Levels (ASIL) for TAPs. Regulations also provide exemption levels, equal to the de minimis emission level for a given criteria pollutant as listed in WAC 173-400-110 or Small Quantity Emission Rates (SQER) for a given TAP as listed in WAC 173-460-150. TAPs with emission rates less than the applicable SQER are assumed to not have the potential to exceed their ASILs, and an air dispersion modeling analysis is not required for those TAPs.

In accordance with Ecology guidance, AERSCREEN dispersion modeling was conducted as a screening level analysis of potential worst-case air emissions. The modeling results indicate that the project is in compliance with air quality standards. An air dispersion modeling memorandum that outlines methodologies and regulatory frameworks that guide the air quality impact assessment for this proposed change to the Facility is provided in Appendix D.

APPENDIX A
Ecology NOC Application Form
and
Streamlined Health Impact Assessment Form
for Emergency Generators



Notice of Construction Application

A notice of construction permit is required before installing a new source of air pollution or modifying an existing source of air pollution. This application applies to facilities in Ecology's jurisdiction. Submit this application for review of your project. For general information about completing the application, refer to Ecology Forms ECY 070-410a-g, "Instructions for Ecology's Notice of Construction Application."

Ecology offers up to two hours of free pre-application assistance. We encourage you to schedule a pre-application meeting with the contact person specified for the location of your proposal below. If you use up your two hours of free pre-application assistance, we will continue to assist you after you submit Part 1 of the application and the application fee. You may schedule a meeting with us at any point in the process.

Upon completion of the application, please enclose a check for the initial fee and mail it to:

**Department of Ecology
Cashiering Unit
PO Box 47611
Olympia, WA 98504-7611**

For Fiscal Office Use Only: 0299-3030404-B00-216-001-000404

Check the box for the location of your proposal. For assistance, call the appropriate office listed below:

Check Box	Permitting Authority	Contact Info
☒ CRO	Chelan, Douglas, Kittitas, Klickitat, or Okanogan County Ecology Central Regional Office – Air Quality Program 1250 West Alder Street; Union Gap, WA 98903	Central Region Reception 509-575-2490 airportablesourceCRO@ecy.wa.gov
☐ ERO	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Stevens, Walla Walla, or Whitman County Ecology Eastern Regional Office – Air Quality Program 4601 North Monroe Street; Spokane, WA 99205	Air Quality Reception 509-329-3452 ecyaqciero@ecy.wa.gov
☐ IND	Pulp Mills and Aluminum Smelters Ecology Industrial Section P.O. Box 47600; Olympia, WA 98504-7600	ECY RE INDUSTRIAL SECTION (SWM) industrialsection@ECY.WA.GOV (360) 407-6868
☐ NWP	Hanford Nuclear Reservation Ecology Nuclear Waste Program 3100 Port of Benton Boulevard; Richland, WA 99354	Richland Field Office 509-372-7950 HanfordAir@ecy.wa.gov

Check the box below for the fee that applies to your application.

New project or equipment: Rocky Reach New Emergency Generator

- ☒ **\$2,256: Basic project** initial fee covers up to 16 hours of review.
- ☐ **\$14,948: Complex project** initial fee covers up to 106 hours of review.

Change to an existing permit or equipment:

- ☐ **\$423: Administrative or simple change** initial fee covers up to 3 hours of review. Ecology may determine that your change is complex during the completeness review of your application. If your project is complex, you must pay the additional fee before we continue working on your application
- ☐ **\$1,410: Complex change** initial fee covers up to 10 hours of review
- ☐ **\$415 flat fee:** Replace or alter control technology equipment under WAC 173-400-114. Ecology will contact you if we determine your change belongs to another fee category. You must pay the fee associated with that category before we will continue working on your application.

Read each statement below, then check the box next to it to acknowledge that you agree.

- ☒ The initial fee you submitted may not cover the cost of processing your application. Ecology will track the number of hours spent on your project. If the number of hours Ecology exceeds the hours included in your initial fee, Ecology will bill you \$141 per hour for the extra time.
- ☒ You must include all information requested by this application. Ecology may not process your application if it does not include all the information requested.
- ☒ Submittal of this application allows Ecology staff to visit and inspect your facility.

Part 1: General Information

I. Project, Facility, and Company Information

1. Project Name: Rocky Reach Emergency Generator Project
2. Facility Name: PUD No. 1 of Chelan County Rocky Reach Dam
3. Facility Street Address:

5000 HWY 97
4. Facility Legal Description: _____
5. Company Legal Name (if different from Facility Name):

6. Company Mailing Address (street, city, state, zip)

P.O. Box 1231, Wenatchee, WA, 98807-1231

II. Contact Information and Certification

1. Facility Contact Name (who will be onsite): Jennifer Finley
2. Facility Contact Mailing Address (if different than Company Mailing Address):

3. Facility Contact Phone Number: (509) 661-4474
4. Facility Contact E-mail: jennifer.finley@chelanpud.org

5. Billing Contact Name (who should receive billing information):
Jennifer Finley
6. Billing Contact Mailing Address (if different from Company Mailing Address):

7. Billing contact Phone Number: (509) 661-4474
8. Billing Contact E-mail: jennifer.finley@chelanpud.org
9. Consultant Name (optional – if 3rd party hired to complete application elements):
Annika Wallendahl, P.E.
10. Consultant Organization/Company: Geosyntec Consultants, Inc
11. Consultant Mailing Address (street, city, state, zip): 810 5th Ave, Suite 2200, Seattle, WA 98104
12. Consultant Phone Number: (206) 858-4384
13. Consultant E-mail: annika.wallendahl@geosyntec.com
14. Responsible Official Name and Title (who is responsible for project policy or decision making):
Chad Bowman, Director Project Delivery
15. Responsible Official Phone: 509-661-4605
16. Responsible Official E-mail: chad.bowman@chelanpud.org
17. Responsible Official Certification and Signature:

I certify that the information on this application is accurate and complete.

DocuSigned by:
Signature: *Jacob Huxley* Acting Project Delivery Director Date: 4/27/2026
00A0EC2DD661495...

Part 2: Technical Information

Technical Information may be sent with this application form to the Cashiering Unit or may be sent directly to the Ecology regional office with jurisdiction, along with a copy of this application form.

For all sections, check the box next to each item as you complete it.

III. Project Description

- ☒ Written narrative describing your proposed project.
- ☒ Projected construction starts and completion dates.
- ☒ Operating schedule and production rates.
- ☒ List of all major process equipment and manufacturers, and maximum rated capacity.
- ☒ Process flow diagram with all emission points identified.
- ☒ Plan a view site map.
- ☒ Manufacturer specification sheets for major process equipment components
- ☒ Manufacturer specification sheets for pollution control equipment.
- ☒ Fuel specifications, including type, consumption (per hour and per year), and percent sulfur.

IV. State Environmental Policy Act (SEPA) Compliance

Check the appropriate box below.

- ☒ SEPA review is complete. Include a copy of the final SEPA checklist and SEPA determination (e.g., DNS, MDNS, and EIS) with your application.
- ☐ SEPA review has not been conducted:
 - ☐ If review will be conducted by another agency, list the agency. You must provide a copy of the final SEPA checklist and SEPA determination before Ecology will issue your permit.
Agency reviewing SEPA: _____
 - ☐ If the review will be conducted by Ecology, fill out a SEPA checklist and submit it with your application. You can find a SEPA checklist online at <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-document-templates>

V. Emissions Estimations of Criteria Pollutants

Does your project generate criteria for air pollutant emissions? ☒ Yes ☐ No

If yes, please provide the following information regarding your criteria for emissions in the application.

- ☒ The names of the criteria air pollutants emitted (i.e., NO_x, SO₂, CO, PM_{2.5}, PM₁₀, TSP, VOC, and Pb)
- ☒ Potential emissions of criteria air pollutants in tons per hour, tons per day, and tons per year (include calculations)
- ☒ If there will be any fugitive criteria pollutant emissions, clearly identify the pollutant and quantity

VI. Emissions Estimations of Toxic Air Pollutants

Does your project generate toxic air pollutant emissions? ☒ Yes ☐ No

If yes, please provide the following information regarding your toxic air pollutant emissions in your application.

- ☒ The names of the toxic air pollutants emitted (specified in [WAC 173-460-150](http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460-150)¹)
- ☒ Potential emissions of toxic air pollutants in pounds per hour, pounds per day, and pounds per year (including calculations)
- ☒ If there will be any fugitive toxic air pollutant emissions, clearly identify the pollutant and quantity

VII. Emission Standard Compliance

- ☒ Provide a list of all applicable new source performance standards, national emission standards for hazardous air pollutants, national emission standards for hazardous air pollutants for source categories, and emission standards adopted under Chapter 70A.15 RCW.

Does your project comply with all applicable standards identified? ☐ Yes ☐ No

VIII. Best Available Control Technology

- ☒ Provide a complete evaluation of Best Available Control Technology (BACT) for your proposal.

IX. Ambient Air Impacts Analyses

Please provide the following:

- ☒ Ambient air impacts analyses for Criteria Air Pollutants (including fugitive emissions)
- ☒ Ambient air impacts analyses for Toxic Air Pollutants (including fugitive emissions)
- ☒ Discharge point data for each point included in air impacts analyses (including only if modeling is required)
 - ☒ Exhaust height
 - ☒ Exhaust inside dimensions (ex., diameter or length and width)
 - ☒ Exhaust gas velocity or volumetric flow rate
 - ☒ Exhaust gas exit temperature
 - ☒ The volumetric flow rate
 - ☒ Description of the discharges (i.e., vertically or horizontally) and whether there are any obstructions (ex., raincap)
 - ☒ Identification of the emission unit(s) discharging from the point
 - ☒ The distance from the stack to the nearest property line
 - ☒ Emission unit building height, width, and length
 - ☒ Height of the tallest building on-site or in the vicinity and the nearest distance of that building to the exhaust
 - ☒ Whether the facility is in an urban or rural location

Does your project cause or contribute to a violation of any ambient air quality standard or acceptable source impact level? ☐ Yes ☒ No

To request an ADA accommodation, email aqpubs@ecy.wa.gov, call (360) 407-6800, or dial 711 to call through the Washington Telecommunications Relay for services like text telephone (TTY). Visit Ecology.wa.gov/ADA for more accessibility information.

¹ <http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460-150>



Streamlined HIA Form for Emergency Generators

Please complete one per engine

I. PROJECT INFORMATION

1. Company Name: PUD No.1 of Chelan County Rocky Reach		
2. Company Mailing Address (street, city, state, zip): P.O. Box 1231, Wenatchee, WA, 98807-1231		
3. Company Contact Person, Title: Jennifer Finley	4. Company Phone Number:	5. Company Fax Number:
6. Contact Person Phone Number: (509) 661-4474	7. E-Mail Address: jennifer.finley@chelanpud.org	
8. UTM or Lat/Long Coordinates of Facility 47.53161°, -120.29951°	9. Ecology Permitting Staff Contact: Ryan Vicente	

II. FACILITY INFORMATION

Diagram (or current aerial map) of buildings, property boundary & engine. Please include north arrow and relationship of engine to buildings and other engines. (Include approximate scale with diagram/aerial map).	
2. New Engine ☒ Existing Engine ☐ Reconstructed Engine ☐ Replacement Engine ☐	
3. Remote Location ☐ Emergency Power System ☒ Other ☐	
4. Distance from engine to Property Boundary (or provide diagram to scale)_____	
5. Distance from engine to building (or provide diagram to scale)_____	

6. Height of Building(s) _____ Width of Building(s); (or provide diagram to scale) _____ Depth of Building(s); (or provide diagram to scale) _____
7. Stack height Stack diameter Stack height: 8.8 ft, Stack diameter: 6 inches

II. ENGINE INFORMATION

1. Engine manufacturer: Caterpillar Inc.
2. Model: Caterpillar C18 In-line 6, 4-cycle Diesel
3. Year of manufacture: _____
4. Engine size: 1006 hp
5. Exhaust temperature 452.94 °Celsius
6. Exhaust flow rate: 2078.6 feet/sec
7. Fuel: Diesel
8. Maximum hourly fuel consumption: 53.6 gal/hr

IV. OTHER INFORMATION

1. Number of engines in project 1
2. Number of Emergency Engines at Facility 2
3 Is the engine specification sheet available? If so, please attach it to this form.

APPENDIX B

Detailed Emission Calculations

Criteria Pollutant Emissions Summary from New Engine
Rocky Reach Emergency Generator - Air Permitting - Emissions Calculations

Pollutant	Emissions (lbs/hr)	Emissions (tons/year)	Exemption Threshold Levels (tons/year) ⁽²⁾	Exceeds Threshold?
NO _x	12.02	3.00	2	YES
CO	0.49	0.12	5	NO
SO ₂	0.01	2.82E-03	2	NO
VOC	0.13	3.33E-02	2	NO
PM	0.20	4.99E-02	1.25	NO
PM ₁₀ ⁽¹⁾	0.20	4.99E-02	0.75	NO
PM _{2.5} ⁽¹⁾	0.20	4.99E-02	0.5	NO
CO ₂ e	1132	283	--	NO

1. Assumption that PM = PM₁₀ = PM_{2.5}

2. [WAC 173-400-110 New Source Review \(NSR\) for sources and portable sources](#)

Toxic Air Pollutant (TAP) Emissions Summary from New Engine
Rocky Reach Emergency Engine - Air Permitting - Emissions Inventory

Pollutant	Emissions (lbs/hr)	Emissions (tons/year)	WAC 173-460-150 SQER Averaging Period	Emissions (lb/Averaging Period)	WAC 173-460-150 SQER Averaging Period (lb/Averaging period)	Emissions > SQER?	WAC 173-460-150 De Minimis Rate (lb/Averaging period)	Emissions > De Minimis?
Benzene	1.75E-02	4.38E-03	year	8.75E+00	21	NO	1	YES
Toluene	5.87E-03	1.47E-03	24-hr	1.41E-01	370	NO	19	NO
Xylene	2.25E-03	5.62E-04	24-hr	5.39E-02	16	NO	0.82	NO
1,3-Butadiene	1.15E-02	2.88E-03	year	5.76E+00	5.4	YES	0.27	YES
Formaldehyde	9.15E-02	2.29E-02	year	4.57E+01	27	YES	1.4	YES
Acetaldehyde	4.15E-02	1.04E-02	year	2.08E+01	60	NO	3	YES
Acrolein	1.80E-03	4.49E-04	24-hr	4.31E-02	0.026	YES	0.0013	YES
Naphthalene	1.69E-03	4.22E-04	year	8.45E-01	4.8	NO	0.24	YES
Propylene	2.48E-02	6.19E-03	24-hr	5.94E-01	220	NO	11	NO
Benzo(a)anthracene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Chrysene	1.48E-05	3.71E-06	year	7.42E-03	8.9	NO	0.45	NO
Benzo(b)fluoranthene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Benzo(k)fluoranthene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Benzo(a)pyrene	1.48E-05	3.71E-06	year	7.42E-03	0.16	NO	0.0082	NO
Diesel engine exhaust, particulate	6.65E-02	1.66E-02	year	3.33E+01	0.54	YES	0.027	YES
Indeno(1,2,3-cd)pyrene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Dibenz(a,h)anthracene	1.48E-05	3.71E-06	year	7.42E-03	0.082	NO	0.0041	YES
Nitrogen dioxide ⁽¹⁾	12.02	3.00	1-hr	1.20E+01	0.87	YES	0.46	YES

[WAC 173-460-150 Table of ASIL, SQER and de minimis emission values](#)

1. NO₂ emissions are assumed to be the same as NO_x

APPENDIX C

BACT/tBACT Supporting Documents

Table C.1. Summary of BACT/tBACT Alternatives for New Emergency Generator
Caterpillar C18, in-line 6, 4-cycle diesel 750 kW Engine

Agency Database Reference	Process Description	Project Equipment	Pollutant	Summary of Listed Controls	Link
RBLC	I.C. Engine, Stationary, Emergency	2923 hp Diesel-fired Emergency Generator	NOx	Emission Limit: 5.36 g/kW-h Good combustion practices including compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29297&Process_ID=116317&Pollutant_ID=149&Per_Control_Equipment_Id=177022
RBLC	I.C. Engine, Stationary, Emergency	2923 hp Diesel-fired Emergency Generator	VOC	Emission Limit: 0.56 g/kW-h Good combustion practices including compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29297&Process_ID=116317&Pollutant_ID=218&Per_Control_Equipment_Id=177024
RBLC	I.C. Engine, Stationary, Emergency	2500 kW Diesel-fired Emergency Generator	NOx	Emission Limit: 6.4 g/kW-h average of three 1-hr stack test runs Proper engine design and good combustion practices Low sulfur diesel fuel Limit hours of non-emergency operation for each emergency generator Compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29324&Process_ID=116455&Pollutant_ID=149&Per_Control_Equipment_Id=177683
RBLC	I.C. Engine, Stationary, Emergency	2500 kW Diesel-fired Emergency Generator	VOC	Proper engine design and good combustion practices Combust only clean, low sulfur diesel fuel Installation time retard for NOx emissions Limit hours of non-emergency operation for each emergency generator Compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29324&Process_ID=116455&Pollutant_ID=218&Per_Control_Equipment_Id=177727
RBLC	I.C. Engine, Stationary, Emergency	1140 hp Diesel-fired Emergency Generator	NOx	Emission Limit: 4.8 g/hp-hr NMHC + NOX Proper equipment design and good combustion practices Ultra-low sulfur diesel fuel Low emission combustion Compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.ProcessInfo&Facility_id=29239&PROCESS_ID=115904
RBLC	I.C. Engine, Stationary, Emergency	1140 hp Diesel-fired Emergency Generator	VOC	Emission Limit: 4.8 g/hp-hr NMHC + NOX Proper equipment design and good combustion practices Ultra-low sulfur diesel fuel Low emission combustion Compliance with 40 CFR 60 Subpart IIII	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.ProcessInfo&Facility_id=29239&PROCESS_ID=115904
RBLC	I.C. Engine, Stationary, Emergency	1000 kW Diesel-fired Emergency Generator	NOx	Emission Limit: 3.81 g/hp-hr Good combustion practices Meeting NSPS Subpart IIII requirements	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29157&Process_ID=115431&Pollutant_ID=149&Per_Control_Equipment_Id=174121
RBLC	I.C. Engine, Stationary, Emergency	1490 hp Diesel-fired Emergency Generator		Emission Limit: 4.8 g/hp-hr Emission limit: 500 hrs per year for maintenance and testing Good combustion practices include operational and design elements	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29185&Process_ID=115639&Pollutant_ID=218&Per_Control_Equipment_Id=175522
RBLC	I.C. Engine, Stationary, Emergency	1490 hp Diesel-fired Emergency Generator	NOx	Emission Limit: 4.8 g/hp-hr Emission limit: 500 hrs per each 12 rolling calendar months Good combustion practices and combusting clean fuels	https://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.PollutantInfo&Facility_ID=29185&Process_ID=115639&Pollutant_ID=149&Per_Control_Equipment_Id=175519

Abbreviations

NOx = Nitrous Oxides
VOC = Volatile Organic Compounds
TAPs = Washington Toxic Air Pollutants
SO2 = Sulfur Dioxide
PM = Particulate Matter
CO = Carbon Monoxide

Databases Cited

RBLC = EPA RACT/BACT/LAER Clearinghouse (<https://cfpub.epa.gov/rblc/>)

APPENDIX D

AERSCREEN Modeling Memorandum

MEMORANDUM

Date: March 16, 2026

To: Jennifer Finley, Chelan County PUD No.1

From: Annika Wallendahl, PE, Fuad Wadud, PE, Jeremy Luebke, PE
Geosyntec Consultants

Subject: **Air Pollutant AERSCREEN Modeling Documentation for Chelan County
PUD No. 1, Rocky Reach Emergency Generator Project**

INTRODUCTION

This air dispersion modeling memorandum has been prepared to support the Notice of Construction application for the Chelan County PUD No.1 (CCPUD) Rocky Reach emergency generator project located at the Rocky Reach Hydroelectric Facility (the Facility), located at 5000 Highway 97, in Wenatchee, Washington. CCPUD plans to install a diesel Caterpillar C18, 4-cycle, 750 kW, emergency generator engine to provide backup power to Station Service Bus 2. Station Service Bus 2 is used to operate multiple Powerhouse units including unwatering pumps, feeder breakers, exciters, and associated equipment. New switchgear will be installed in the Powerhouse control room in conjunction with the new generator engine.

This memorandum outlines the methodologies and regulatory frameworks that guide the ambient air quality impact assessment for this proposed change to the Facility. The air dispersion modeling analysis is designed to promote compliance with federal, state, and local air quality standards, including the National Ambient Air Quality Standards (NAAQS), and to address potential health risk impacts associated with Facility operations.

The air dispersion modeling performed and summarized in this memorandum addresses impacts to ambient air quality from the emissions of criteria and toxic air pollutants related to the operation of a new 750 kW backup generator at the Facility. Washington regulations (WAC 173-460) require that toxic air pollutant (TAP) emission increases attributable to new or modified emission units do not exceed the Acceptable Source Impact Levels (ASILs), which are designed to protect human health and safety. Regulations also provide screening emission levels, called Small Quantity Emission Rates (SQERs). An ASIL and SQER has been established for each listed TAP under WAC 173-460-150. A source demonstrates compliance with this rule by either demonstrating that maximum emissions are

less than the SQER or that predicted ambient concentrations are below the ASIL as outlined in WAC 173-460-150.

If the TAP emissions rate from a unit is below the respective SQER, no further determination of compliance is required. However, if the TAP emissions rate from a source is above the respective SQER, dispersion modeling is used to demonstrate that the predicted concentration of each contaminant is below the corresponding ASIL. If the predicted ambient concentrations from the modeling are below the ASIL, no further review is required.

For this project, TAPs exceeded their respective SQERs, so an ambient air impact analysis was performed using the AERSCREEN¹. The emissions rate and air quality modeling applicability for criteria and toxic air pollutants are provided in Tables 1 and 2 in Attachment A.

Air Quality Model Overview

AERSCREEN is a single-source 2-dimensional gaussian dispersion screening model. It is 2-dimensional as it does not account for wind direction for impact prediction, such that impact predictions are only for “downwind distance.”

Each AERSCREEN run used an emission rate of 1 pound-per-hour. This unit emission rate is used so that scaling of each individual compound can be done without having to model each compound separately. The inputs to the AERSCREEN model used for this analysis are discussed in the following section.

Dispersion Model Inputs

The AERSCREEN model setup assumed one emission stack, the new emergency generator. When defining the emitting source within AERSCREEN, necessary parameters include stack height, exit temperature, flow rate, and several other parameters.

An additional consideration is to determine the land use for this particular site. Using Google Earth, the land use was determined to be classified as “rural” land use due the surround areas land use types being less than 50% impervious surface categories. The surrounding area also has a population density less than 750 persons/km².

Terrain elevations for receptors, buildings, and sources are determined using National Elevation Dataset (NED) supplied by the United States Geological Survey (USGS). NED data retrieved for this model have a grid spacing of 1/3 arc-second or 10 m. The AERSCREEN preprocessor, AERMAP version 18081, is used to compute model object elevations from the NED grid spacing.

A list of the model input parameters used for the sources and the source building being analyzed is summarized in Table 1.

¹ https://gaftp.epa.gov/Air/aqmg/SCRAM/models/screening/aerscreen/aerscreen_userguide.pdf

Table 1 –Modeling Parameters Used for AERSCREEN

Parameter	New Generator (100% Load)
Stack Height Above Grade (feet)	8.8
BPIP Downwash?	No
Land Use Classification	Rural
Initial Probe Distance (meters)	3
Ambient Distance (meters)	5,000
Stack Diameter (inches)	6
Plume Exit Temperature (°F)	847.3
Stack Air Flow Rate (ACFM*)	2,078.6

Receptor Locations

Receptors within the AERSCREEN 2-dimensional model are strictly a downwind distance from the source, starting at the property boundary (3 meters), and continuing out to a maximum distance of 2,500 meters. Receptors elevations were included using AERMAP for the representative area. USGS NED data was used to determine receptor elevations.

Meteorological Data

As part of the AERSCREEN model code, AERSCREEN develops a default range of meteorological parameters (wind speed, ambient temperature, and atmospheric stability) that affect potential dispersion. This is done with the subroutine MAKEMET internally within the screening model. A total of 1,344 separate combinations are developed to attempt to span all types of atmospheric conditions.

AERSURFACE was run to determine actual albedo, bowen ratio, and surface roughness factors for the site. Following AERSURFACE guidance defaults, an 1-km circle around the property was used to represent the area using NCLD 2021 data for land cover, tree canopy, and impervious surfaces. Following this analysis, the albedo is 0.29, the bowen ratio is 0.925, and the surface roughness is 0.075.

Background Data

Background concentration data for NO₂ 1-hr and annual averaging periods were sourced according to the Washington Ecology AERSCREEN modeling guidance. The 1-hr NO₂ background concentration of 56.4 µg/m³ was obtained from the receptor closest to the Facility in East Wenatchee² (Lat 47.55 N, 120.28 W). The annual NO₂ background concentration of 2.1 µg/m³ (for the 2014-2017 period) was obtained for the receptor closest to the site.³

² NAAQS Background for NO₂ obtained from Washington State Department of Ecology, General Order 25AQ-GO-04, for East Wenatchee.

³ Idaho Dept of Environmental Quality, NW-Airquest Background Concentration lookup tool, 2014-2017

Results

The AERSCREEN model outputs for each source are included as Attachment B. The maximum downwind concentrations are listed in Table 2.

The AERSCREEN output concentrations for a 1 pound-per-hour emission rate were scaled for each criteria pollutant and TAP to determine the downwind concentrations from each source. The AERSCREEN air dispersion model demonstrated that the maximum concentrations of the modeled criteria pollutants and TAPs have impacts less than their respective NAAQS and ASILs. Therefore, since all modeled concentrations are less than the their respective NAAQS and ASIL thresholds, no further analysis is required.

Table 2 –AERSCREEN Outputs and Impacts for Criteria Pollutant NO₂

Pollutant (Criteria)	lb/hr	Averaging Period	Maximum Concentration $\mu\text{g}/\text{m}^3$	Background $\mu\text{g}/\text{m}^3$	Total Impact $\mu\text{g}/\text{m}^3$	NAAQS $\mu\text{g}/\text{m}^3$	% of NAAQS
NO ₂	0.16	1-hr	92.7	56.4	149.1	188	79%
		Annual	9.3	2.1	11.4	100	11%

Annual emission rate obtained by multiplying lb/hr by 8,760 hours of annual operation

Total Impact = Maximum Concentration + Background

Pollutant (HAP/TAP)	lb/hr	Averaging Period	$\mu\text{g}/\text{m}^3$	Standard	% of ASIL ¹
1,3-Butadiene	1.33E-04	Annual	7.60E-03	3.30E-02	23%
Formaldehyde	1.06E-03	Annual	6.04E-02	1.70E-01	36%
Acrolein	2.07E-05	24-hr	7.11E-03	3.50E-01	2%
Diesel engine exhaust, particulate (DEEP) ²	2.40E-03	Annual	1.37E-01	3.30E-03	4151%
NO ₂	1.62E-01	Annual	9.27E+01	4.70E+02	20%

¹Acceptable Source Impact Level (ASIL)

²Per Washington State Department of Ecology, AQP-GUI-2019: Guidance for 500-2000 bhp Emergency Generators, the streamlined health risk assessment protocol. Based on this protocol, CCPUD is not required to submit a second-tier review to demonstrate DEEP particulate emissions meet the ten in a million health risk threshold.

Attachment A
Emission Concentration Calculations

Table 1. Criteria Pollutant Emissions for CCPUD No.1 Rocky Reach Emergency Generator NOC Application

Pollutant	Emissions (lbs/hr)	Emissions (tons/year)	Exemption Threshold Levels (tons/year) ⁽²⁾	Exceeds Threshold?
NO _x	12.02	3.00	2	YES
CO	0.49	0.12	5	NO
SO ₂	0.01	2.82E-03	2	NO
VOC	0.13	3.33E-02	2	NO
PM	0.20	4.99E-02	1.25	NO
PM ₁₀ ⁽¹⁾	0.20	4.99E-02	0.75	NO
PM _{2.5} ⁽¹⁾	0.20	4.99E-02	0.5	NO
CO ₂ e	1132	283	--	NO

1. Assumption that PM = PM₁₀ = PM_{2.5}

2. [WAC 173-400-110 New Source Review \(NSR\) for sources and portable sources](#)

Table 2. Toxic Air Pollutant (TAP) Emissions Summary for Chelan County PUD No. 1 Rocky Reach Emergency –Generator NOC Application

Pollutant	Emissions (lbs/hr)	Emissions (tons/year)	WAC 173-460-150 SQER Averaging Period	Emissions (lb/Averaging Period)	WAC 173-460-150 SQER Averaging Period (lb/Averaging period)	Emissions > SQER?	WAC 173-460-150 De Minimis Rate (lb/Averaging period)	Emissions > De Minimis?
Benzene	1.75E-02	4.38E-03	year	8.75E+00	21	NO	1	YES
Toluene	5.87E-03	1.47E-03	24-hr	1.41E-01	370	NO	19	NO
Xylene	2.25E-03	5.62E-04	24-hr	5.39E-02	16	NO	0.82	NO
1,3-Butadiene	1.15E-02	2.88E-03	year	5.76E+00	5.4	YES	0.27	YES
Formaldehyde	9.15E-02	2.29E-02	year	4.57E+01	27	YES	1.4	YES
Acetaldehyde	4.15E-02	1.04E-02	year	2.08E+01	60	NO	3	YES
Acrolein	1.80E-03	4.49E-04	24-hr	4.31E-02	0.026	YES	0.0013	YES
Naphthalene	1.69E-03	4.22E-04	year	8.45E-01	4.8	NO	0.24	YES
Propylene	2.48E-02	6.19E-03	24-hr	5.94E-01	220	NO	11	NO
Benzo(a)anthracene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Chrysene	1.48E-05	3.71E-06	year	7.42E-03	8.9	NO	0.45	NO
Benzo(b)fluoranthene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Benzo(k)fluoranthene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Benzo(a)pyrene	1.48E-05	3.71E-06	year	7.42E-03	0.16	NO	0.0082	NO
Diesel engine exhaust, particulate	6.65E-02	1.66E-02	year	3.33E+01	0.54	YES	0.027	YES
Indeno(1,2,3-cd)pyrene	1.48E-05	3.71E-06	year	7.42E-03	0.89	NO	0.045	NO
Dibenz(a,h)anthracene	1.48E-05	3.71E-06	year	7.42E-03	0.082	NO	0.0041	YES
Nitrogen dioxide ⁽¹⁾	12.02	3.00	1-hr	1.20E+01	0.87	YES	0.46	YES

[WAC 173-460-150 Table of ASIL, SQER and de minimis emission values](#)

1. NO₂ emissions are assumed to be the same as NO_x

Attachment B
AERSCREEN Output Files

Modeling Parameters

Rocky Reach Emergency Generator - Air Permitting - Modeling

Operating Schedule ⁽¹⁾	100	hours
Fuel Heat Content ⁽³⁾	0.130569	MMBtu/gal
Location Information (X) ⁽⁹⁾	703246.54	meters
Location Information (Y) ⁽⁹⁾	5267767.69	meters
Rain Cap/Hat ⁽²⁾	Yes	
Orientation ⁽²⁾	Vertical	

Percent Load		100 %
Generator Power	750	kW
	1112	bhp
Fuel Consumption ⁽⁴⁾	53.6	gal/hr

Percent Load	Stack Height ⁽³⁾	Stack Diameter ⁽²⁾	Stack Temperature ^(4b)	Flow Rate ^(4c)
%	feet	inches	F	cfm
100	8.8	6	847.3	2078.6
Pollutant	Emission Factor	EF Units	Hourly Emissions (lb/hour)	tpy
Criteria Pollutants ^(4a)				
NO _x (as NO ₂) ⁽¹⁰⁾	14.2	lb/hr	14.2	0.71
CO	1.00	lb/hr	1.00	0.05
HC	0.27	lb/hr	0.27	1.35E-02
PM ⁽⁸⁾	0.41	lb/hr	0.41	2.05E-02
Toxic Air Pollutants ⁽⁵⁾				
1,3-Butadiene	1.67E-03	lb/MMBtu	1.17E-02	5.83E-04
Formaldehyde	1.32E-02	lb/MMBtu	9.25E-02	4.63E-03
Acrolein	2.60E-04	lb/MMBtu	1.82E-03	9.09E-05
Diesel engine exhaust, particulate ⁽⁷⁾	3.00E-02	g/hp-hr	0.07	3.68E-03

Percent Load		75 %
Generator Power	562.5	kW
	840	bhp
Fuel Consumption ⁽⁴⁾	42.8	gal/hr

Percent Load	Stack Height ⁽³⁾	Stack Diameter ⁽²⁾	Stack Temperature ^(4b)	Flow Rate ^(4c)
%	feet	inches	F	cfm
75	8.8	6	765.3	1948
Pollutant	Emission Factor	EF Units	Hourly Emissions (lb/hour)	tpy
Criteria Pollutants ^(4a)				
NO _x (as NO ₂) ⁽¹⁰⁾	7.44	lb/hr	7.44	0.37
CO	0.96	lb/hr	0.96	0.05
HC	0.28	lb/hr	0.28	1.40E-02
PM ⁽⁸⁾	0.43	lb/hr	0.43	2.15E-02
Toxic Air Pollutants ⁽⁵⁾				
1,3-Butadiene	1.67E-03	lb/MMBtu	9.30E-03	4.65E-04
Formaldehyde	1.32E-02	lb/MMBtu	7.39E-02	3.69E-03
Acrolein	2.60E-04	lb/MMBtu	1.45E-03	7.25E-05
Diesel engine exhaust, particulate ⁽⁷⁾	3.00E-02	g/hp-hr	0.06	2.78E-03

Percent Load		50 %
Generator Power	375	kW
	575	bhp
Fuel Consumption ⁽⁴⁾	28.4	gal/hr

Percent Load	Stack Height ⁽³⁾	Stack Diameter ⁽²⁾	Stack Temperature ^(4b)	Flow Rate ^(4c)
%	feet	inches	F	cfm
50	8.8	6	659.1	1481.3
Pollutant	Emission Factor	EF Units	Hourly Emissions (lb/hour)	tpy
Criteria Pollutants ^(4a)				
NO _x (as NO ₂) ⁽¹⁰⁾	4.89	lb/hr	4.89	0.24
CO	0.31	lb/hr	0.31	1.55E-02
HC	0.20	lb/hr	0.20	1.00E-02
PM ⁽⁸⁾	0.29	lb/hr	0.29	1.45E-02
Toxic Air Pollutants ⁽⁵⁾				
1,3-Butadiene	1.67E-03	lb/MMBtu	6.17E-03	3.09E-04
Formaldehyde	1.32E-02	lb/MMBtu	4.90E-02	2.45E-03
Acrolein	2.60E-04	lb/MMBtu	9.63E-04	4.81E-05
Diesel engine exhaust, particulate ⁽⁷⁾	3.00E-02	g/hp-hr	0.04	1.90E-03

Percent Load		25 %		
Generator Power	187.5	kW		
	315	bhp		
Fuel Consumption ⁽⁴⁾	16.6	gal/hr		
Percent Load	Stack Height ⁽³⁾	Stack Diameter ⁽²⁾	Stack Temperature ^(4b)	Flow Rate ^(4c)
%	feet	inches	F	cfm
25	8.8	6	601.4	960.8
Pollutant	Emission Factor	EF Units	Hourly Emissions (lb/hour)	tpy
Criteria Pollutants^(4a)				
NO _x (as NO ₂) ⁽¹⁰⁾	3.2	lb/hr	3.2	0.16
CO	1.28	lb/hr	1.28	0.06
HC	0.23	lb/hr	0.23	1.15E-02
PM ⁽⁸⁾	0.34	lb/hr	0.34	1.70E-02
Toxic Air Pollutants⁽⁵⁾				
1,3-Butadiene	1.67E-03	lb/MMBtu	3.61E-03	1.80E-04
Formaldehyde	1.32E-02	lb/MMBtu	2.87E-02	1.43E-03
Acrolein	2.60E-04	lb/MMBtu	5.63E-04	2.81E-05
Diesel engine exhaust, particulate ⁽⁷⁾	3.00E-02	g/hp-hr	0.02	1.04E-03

Percent Load		10 %		
Generator Power	75	kW		
	155	bhp		
Fuel Consumption ⁽⁴⁾	9.5	gal/hr		
Percent Load	Stack Height ⁽³⁾	Stack Diameter ⁽²⁾	Stack Temperature ^(4b)	Flow Rate ^(4c)
%	feet	inches	F	cfm
10	8.8	6	500.0	665.3
Pollutant	Emission Factor	EF Units	Hourly Emissions (lb/hour)	tpy
Criteria Pollutants^(4a)				
NO _x (as NO ₂) ⁽¹⁰⁾	1.85	lb/hr	1.85	0.09
CO	4.73	lb/hr	4.73	0.24
HC	1.91	lb/hr	1.91	0.10
PM ⁽⁸⁾	2.23	lb/hr	2.23	1.12E-01
Hazardous Air Pollutants/ WA Toxic Air Pollutants^(5,6)				
1,3-Butadiene	1.67E-03	lb/MMBtu	2.07E-03	1.03E-04
Formaldehyde	1.32E-02	lb/MMBtu	1.64E-02	8.20E-04
Acrolein	2.60E-04	lb/MMBtu	3.22E-04	1.61E-05
Diesel engine exhaust, particulate ⁽⁷⁾	3.00E-02	g/hp-hr	0.01	5.13E-04

Notes

- Per estimated annual usage of emergency generator as stated in the proposal between Geosyntec and the Client
- Client provided information
- Per Manufacturer's Specifications provided by Equipment Vendor. [Generator Specs 750kw.pdf](#)
- Per Max Performance Data provided by Equipment Vendor. [22_Performance data.pdf](#)
- (4a) Rated Speed Potential Site Variation: 1800RPM Emissions Data
- (4b) Engine Outlet Temp
- (4c) Engine Outlet Dry Exhaust Gas Vol Flow Rate
5. AP-42, Chapter 3.3, Table 3.3-2 Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engines, updated April 2025
- Emission factors used for HAPs and WA TAPs are the maximum emission factors amongst CARB, Ventura APCD and AP-42 provided values.
- Diesel engine exhaust particulate estimated to be equal to filterable PM emission factor
- To account for condensable PM, PM emission factor = PM (filterable) + HC (condensable) emission factors.
- Latitude and Longitude (47.531526, -120.299620) of new emergency generator from Google Earth, converted to UTM in meters. WA is located in UTM Zone 10. <https://www.latlong.net/lat-long-utm.html>
- Nitrogen dioxide (NO₂) is also a WA TAP and assumed to have the same emission factor as NO_x

Conversions

1 ton	2000 lbs
1 kW	1.34102 hp
1 lb	453.592 g
1 day	24 hours

APPENDIX E

Manufacturer Specification Sheets and SDSs

Standby & Prime: 60Hz



Image shown might not reflect actual configuration

Engine Model	Cat® C18 In-line 6, 4-cycle Diesel
Bore x Stroke	145 mm x 183 mm (5.7 in x 7.2 in)
Displacement	18.13 L (1106.3 in³)
Compression Ratio	14:1
Aspiration	Turbocharged Air-to-Air Aftercooled
Fuel Injection System	Electronic Unit Injection
Governor	Electronic ADEM™ A4

Model	Standby	Prime	Emission Strategy
C18	750 ekW, 938 kVA	680 ekW, 850 kVA	EPA TIER II

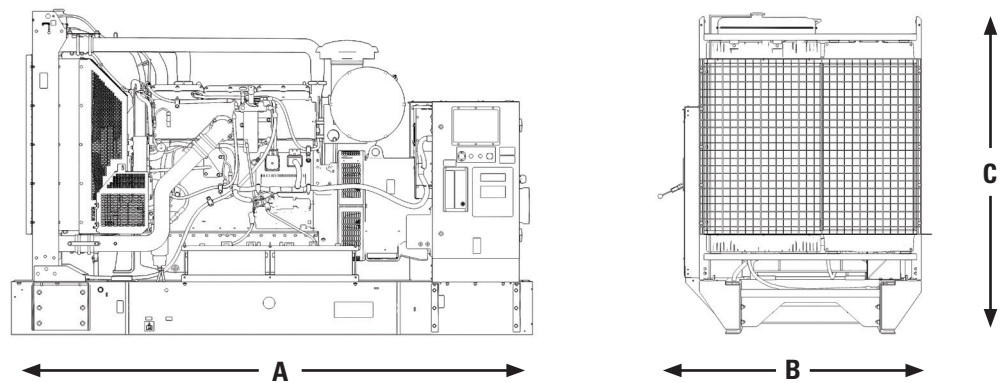
PACKAGE PERFORMANCE

Performance	Standby	Prime
Frequency	60 Hz	
Genset Power Rating	938 kVA	850 kVA
Genset power rating with fan @ 0.8 power factor	750 ekW	680 ekW
Emissions	EPA TIER II	
Performance Number	EM3842	EM3843
Fuel Consumption		
100% load with fan, L/hr (gal/hr)	200.8 (53.0)	184.3 (48.4)
75% load with fan, L/hr (gal/hr)	160.6 (42.4)	143.0 (37.7)
50% load with fan, L/hr (gal/hr)	106.5 (28.1)	98.0 (25.8)
25% load with fan, L/hr (gal/hr)	62.1 (16.4)	58.0 (15.3)
Cooling System¹		
Radiator air flow restriction (system), kPa (in. water)	0.12 (0.48)	0.12 (0.48)
Radiator air flow, m³/min (CFM)	900 (31783)	900 (31783)
Engine coolant capacity, L (gal)	20.8 (5.5)	20.8 (5.5)
Radiator coolant capacity, L (gal)	77 (20.3)	77 (20.3)
Total coolant capacity, L (gal)	97.8 (25.8)	97.8 (25.8)
Inlet Air		
Combustion air inlet flow rate, m³/min (CFM)	67.3 (2376)	65.6 (2316)
Max. Allowable Combustion Air Inlet Temp, °C (°F)	49 (120)	49 (120)
Exhaust System		
Exhaust stack gas temperature, °C (°F)	452.9 (847.2)	432.9 (811.2)
Exhaust gas flow rate, m³/min (CFM)	170.7 (6028)	161 (5686)
Exhaust system backpressure (maximum allowable), kPa (in. water)	10.0 (40.0)	10.0 (40.0)
Heat Rejection		
Heat rejection to jacket water, kW (BTU/min)	225 (12795)	208 (11828)
Heat rejection to exhaust (total), kW (BTU/min)	714 (40604)	664 (37761)
Heat rejection to aftercooler, kW (BTU/min)	272 (15468)	253 (14387)
Heat rejection to atmosphere from engine, kW (BTU/min)	142 (8075)	123 (6995)

Emissions (Nominal) ²	Standby	Prime
NOx, mg/Nm ³ (g/hp-hr)	2468 (5.42)	2213 (4.91)
CO, mg/Nm ³ (g/hp-hr)	100.1 (0.22)	75.6 (0.17)
HC, mg/Nm ³ (g/hp-hr)	23.5 (0.06)	24.1 (0.06)
PM, mg/Nm ³ (g/hp-hr)	11.7 (0.03)	10.6 (0.03)

Alternator ³											
Duty Cycle		Standby					Prime				
Phase		3-Phase					3-Phase				
Voltages, V		208	220	240	480	600	208	220	240	480	600
Current, Amps		2602	2460	2255	1128	902	2359	2231	2045	1022	818
Frame: LC7224J Excitation: AREP	Temperature Rise @ 40°C			150	150	150			125	125	125
	Motor Starting Capability @ 30% Voltage Dip, skVA			2512	2512	2512			2512	2512	2512
Frame: LC7224L Excitation: AREP	Temperature Rise @ 40°C	150	130	105	105	130	125	105	105	105	105
	Motor Starting Capability @ 30% Voltage Dip, skVA	1917	2129	2501	2501	2503	1917	2129	2501	2501	2503
Frame: LC7224N Excitation: AREP	Temperature Rise @ 40°C	130	105			105	105	105			80
	Motor Starting Capability @ 30% Voltage Dip, skVA	2403	2666			3368	2403	2666			3368
Frame: LC7224P Excitation: AREP	Temperature Rise @ 40°C	105		80	80		80		80	80	
	Motor Starting Capability @ 30% Voltage Dip, skVA	2392		3120	3120		2392		3120	3120	

WEIGHTS & DIMENSIONS



Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
3512 (138)	1746 (69)	2322 (92)	4863 (10721)

Note: General configuration not to be used for installation. See general dimension drawings for detail.

APPLICABLE CODES AND STANDARDS:

CSA C22.2 No 100-04, UL142, UL489, UL869, cUL/UL2200, NFPA 37, NFPA 70, NFPA 99,NFPA 110, IBC, IEC60034-1, ISO 3046, ISO 8528, NEMA MG 1-33.

Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

PRIME: Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated kW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

RATINGS: Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

DEFINITIONS AND CONDITIONS

- ¹ For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.
- ² Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77° F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 BTU/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.
- ³ UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40° C ambient per NEMA MG1-32.

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Picture shown may not reflect actual configuration

C13/C15/C18

SOUND ATTENUATED ENCLOSURES

US Sourced
Diesel Generator Set
350 - 750 ekW 60 Hz

Features

Robust/Highly Corrosion Resistant Construction

- Factory installed on skid base
- Environmentally friendly, polyester powder baked paint
- 14 gauge steel
- Interior zinc plated fasteners
- Exterior stainless steel fasteners
- Internally mounted exhaust silencing system
- Designed and tested to comply with UL 2200 Listed generator set package
- Compression door latches providing solid door seal

Excellent Access

- Large cable entry area for installation ease
- Accommodates side mounted single or multiple breakers
- Three doors on both sides
- Vertically hinged allow 180° opening rotation and retention with door stays
- Lube oil and coolant drains piped to the exterior of the enclosure base
- Radiator fill cover

Security and Safety

- Lockable access doors which give full access to control panel and breaker
- Cooling fan and battery charging alternator fully guarded
- Fuel fill, oil fill and battery can only be reached via lockable access
- Externally mounted emergency stop button
- Designed for spreader bar lifting to ensure safety
- Stub-up area is rodent proof

Transportability

These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites.

Options

- Enclosure constructed with 14 gauge steel
- Enclosure constructed with 12 gauge aluminum (5052 grade)
- Caterpillar yellow and white paint
- Control panel viewing window[#]
- UL Listed integral fuel tank with 670, 400, and 300 gallon capacities
- UL Listed sub base fuel tank with 660, 1000, 1800, and 2200 gallon capacities.
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, IBC 2012, IBC 2015 CBC 2007, CBC 2010
- IBC Certification for 150 mph wind loading
- AC/DC lighting package
- 5 kW Canopy space heater to facilitate compliance with NFPA 110
- Motorized louvers and gravity discharge damper
- 125A Load Center
- GFCI outlets

[#] Not available with aluminum enclosures.

Level 1 Sound Attenuated Enclosure (Steel) Sound Levels

Model	Standby eKW	Cooling Air Flow Rate		Ambient Capability*		Sound Pressure Levels (dBA) at 7m (23 ft)
		m³/s	cfm	°C	°F	100% Load
C13	350	8.5	18010	57	135	74
	400	8.5	18010	56	133	75
C15	350	10.4	22072	59	138	73
	400	10.4	22072	51	124	73
	450	10.4	22072	46	115	74
	500	12.5	26415	48	118	75
C18	550	8.1	17234	45	113	75
	600	8.1	17234	43	109	75
	650	12.7	26909	51	123	75
	700	12.7	26909	48	118	75
	750	12.7	26909	48	118	75

Sound Attenuated Enclosure (Aluminum) Sound Levels

Model	Standby eKW	Cooling Air Flow Rate		Ambient Capability*		Sound Pressure Levels (dBA) at 7m (23 ft)
		m³/s	cfm	°C	°F	100% Load
C13	350	8.5	-	57	135	75
	400	8.5	-	56	133	75
C15	350	10.4	22072	59	138	72
	400	10.4	22072	51	124	73
	450	10.4	22072	46	115	74
	500	12.5	26415	48	118	75
C18	550	8.1	17234	45	113	76
	600	8.1	17234	43	109	76
	650	12.7	26909	51	123	76
	700	12.7	26909	48	118	76
	750	12.7	26909	48	118	76

Level 2 Sound Attenuated Enclosure (Steel) Sound Levels

Model	Standby eKW	Cooling Air Flow Rate		Ambient Capability*		Sound Pressure Levels (dBA) at 7m (23 ft)
		m³/s	cfm	°C	°F	100% Load
C13	350	7.2	15256	50	122	70
	400	7.2	15256	50	122	70
C15	350	10.4	22071	50	122	72
	400	10.4	22071	50	122	72
	450	10.4	22071	50	122	72
	500	12.5	26415	50	122	72

*Cooling system performance at sea level. Consult your Cat® dealer for site specific ambient and altitude capabilities.
Note: Sound level measurements are subject to instrumentation, installation and manufacturing variability, as well as ambient site conditions.

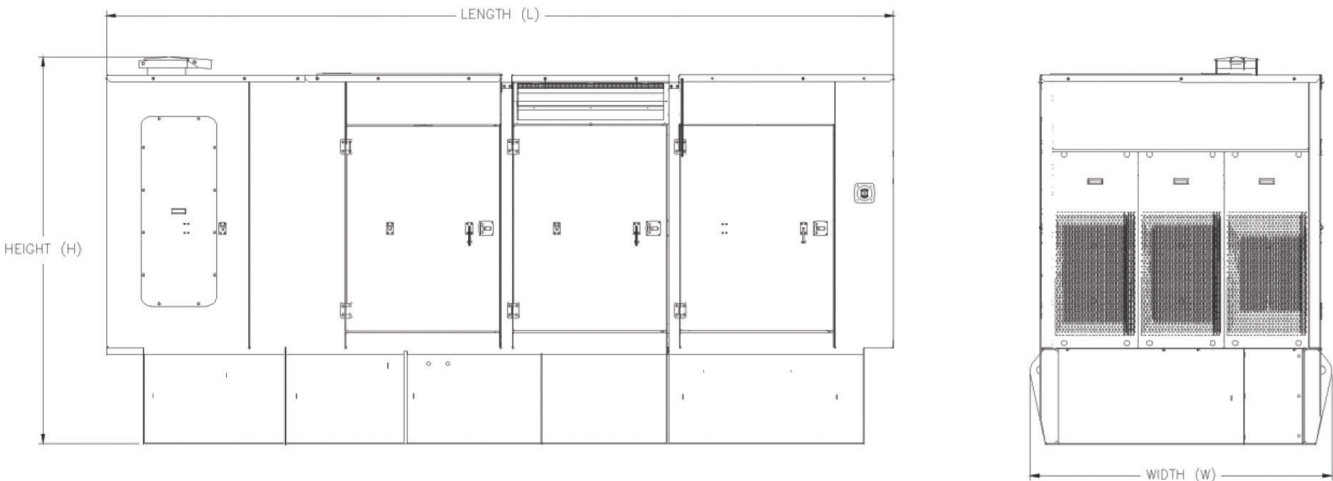
Component Weights to Calculate Package Weight

Model	Standby eKW	Narrow Skid Base		Wide Skid Base		Sound Attenuated Enclosure (Steel)		Sound Attenuated Enclosure (Aluminum)	
		kg	lb	kg	lb	kg	lb	kg	lb
C13	350	253	578	579	1276	1245	2745	765	1687
	400								
C15	350	273	602	465	1025	1245	2745	765	1687
	400								
	450								
	500								
C18	550	301	664	466	1027	1301	2868	817	1801
	600								
	650	286	630	637	1404	1393	3071	887	1955
	700								
	750								

Sound Attenuated Enclosure on Skid Base

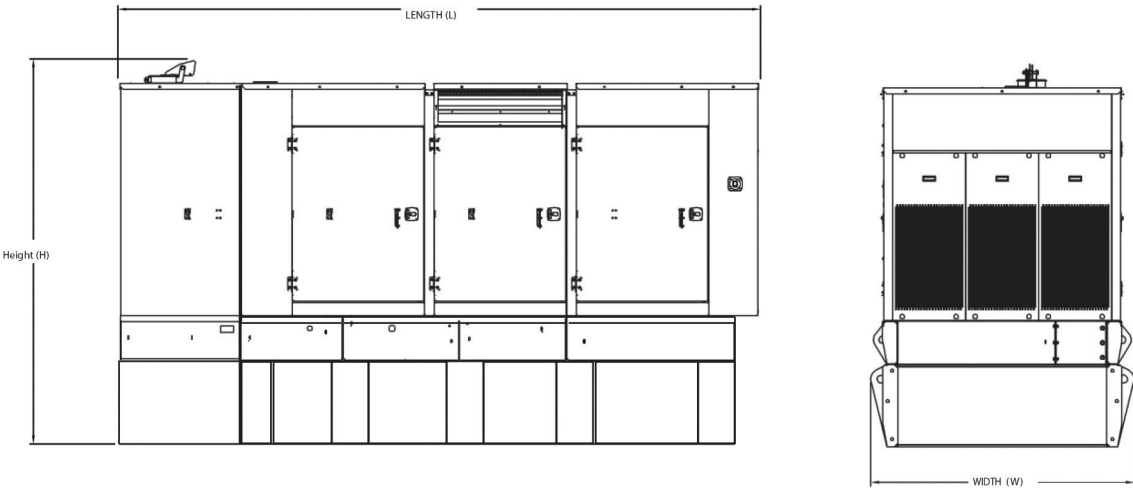
Model	Standby eKW	Length "L"		Width "W"		Height "H"	
		mm	in	mm	in	mm	in
C13	350	4948	194.8	2014	79.3	2320	91.3
	400						
C15	350	4948	194.8	2014	79.3	2320	91.3
	400						
	450						
	500						
C18	550	5183	204.0	2014	79.3	2262	89.0
	600						
	650	5230	205.9	2315	91.1	2253	88.7
	700						
	750						

Sound Attenuated Enclosure on a UL Listed Integral Fuel Tank Base



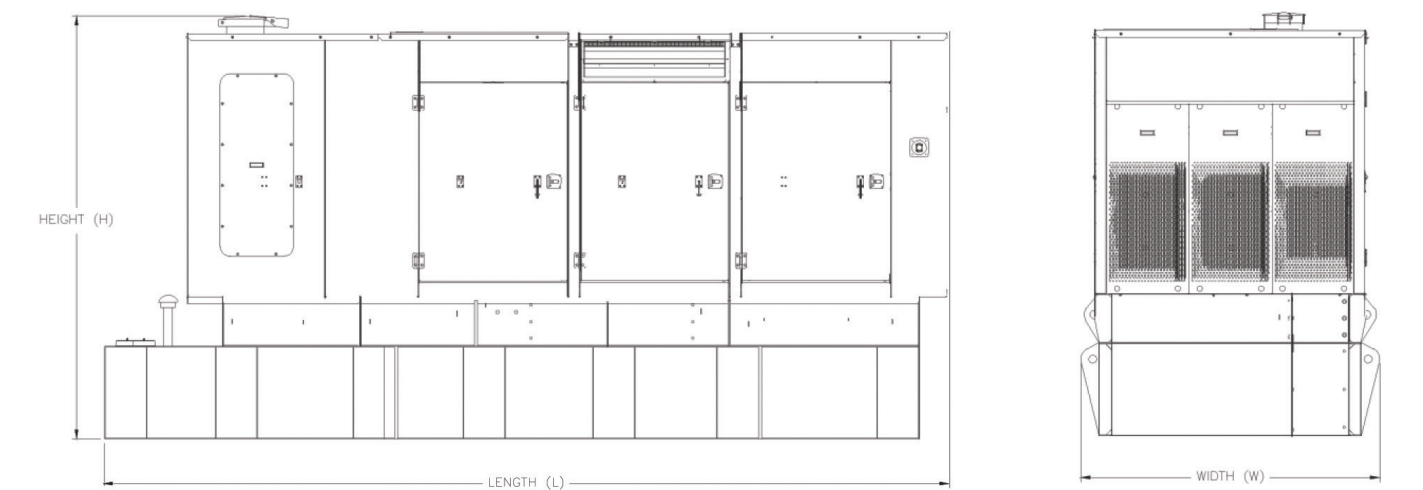
Model	Standby eKW	Length "L"		Width "W"		Height "H"	
		mm	in	mm	in	mm	in
C13	350	5461	215.0	2014	79.3	2743	108.0
	400						
C15	350	4948	194.8	2014	79.3	2619	103.0
	400						
	450						
	500						
C18	550	5187	204.2	2014	79.3	2561	101.0
	600						
	650	6977	274.7	2315	91.1	2675	105.3
	700						
	750						

Sound Attenuated Enclosure on a UL Listed 660 Gallon Sub-Base Fuel Tank Base



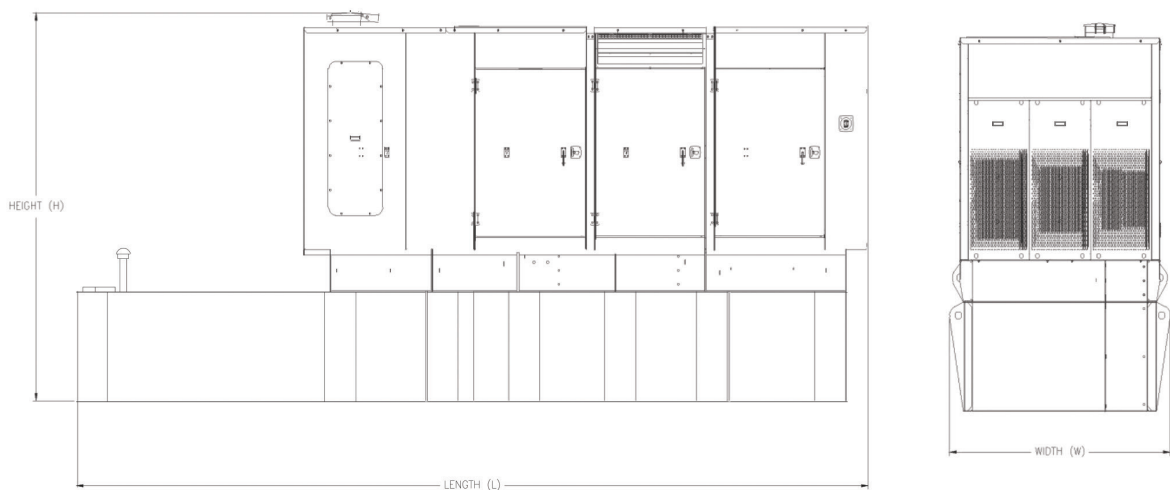
Model	Standby eKW	Length "L"		Width "W"		Height "H"	
		mm	in	mm	in	mm	in
C13	350	4948	194.8	2056	80.9	2955	116.3
	400						
C15	350	4948	194.8	2056	80.9	2955	116.3
	400						
	450						
	500						
C18	550	5184	204.1	2056	80.9	2897	114.1
	600						

Sound Attenuated Enclosure on a UL Listed 1000 Gallon Sub-Base Fuel Tank Base



Model	Standby eKW	Length "L"		Width "W"		Height "H"	
		mm	in	mm	in	mm	in
C13	350	5751	226.4	2056	80.9	2955	116.3
	400						
C15	350	5751	226.4	2056	80.9	2955	116.3
	400						
	450						
	500						
C18	550	5747	226.3	2056	80.9	2897	114.1
	600						

Sound Attenuated Enclosure on a UL Listed 1800 & 2200 Gallon Sub-Base Fuel Tank Base



Model	Standby eKW	Length "L"		Width "W"		Height "H"	
		mm	in	mm	in	mm	in
C13	350	6382	251.2	2056	80.9	3209	126.3
	400						
C15	350	6382	251.2	2056	80.9	3209	126.3
	400						
	450						
	500						
C18	550	7271	286.2	2056	80.9	3151	124.1
	600						

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Annunciator Box

Image shown may not reflect actual configuration.

Features and Benefits

- Easy-to-remove concentric knockouts on all four sides of box with knockouts
- Provision for grounding
- Mounting holes on back of box
- Flush-mount cover with 12 mm overlap all around

Application

- For use with optional shipped loose flush-mounted annunciator

Specifications/Finish

- Galvanized steel box with black powder painted flush-mount cover

Industry Standards

- UL 50, 50E Listed; Type 1; cUL Listed per CSA C22.2 No 40; Type 1
- NEMA/EEMAC Type 1
- IEC 60529, IP30

Box Dimensions		
A x B x C in.	A x B x C mm	Style
12.00 x 8.00 x 4.00	305 x 203 x 102	Galvanized

□ote □ Mounting hardware for the annunciator included.
Please refer to the drawing for hardware and installation



Reference illustration

Jacket Water Heater

Factory installed jacket water heater for increased cold-starting capability. The system includes a tank- style metal heater with an integral high limit thermostat and a remote engine mounted control thermostat, durable silicone hoses and heater control relay wired to a common connection point in the control panel. The heater and thermostat location is optimized for maximum coolant flow and heating power efficiency.

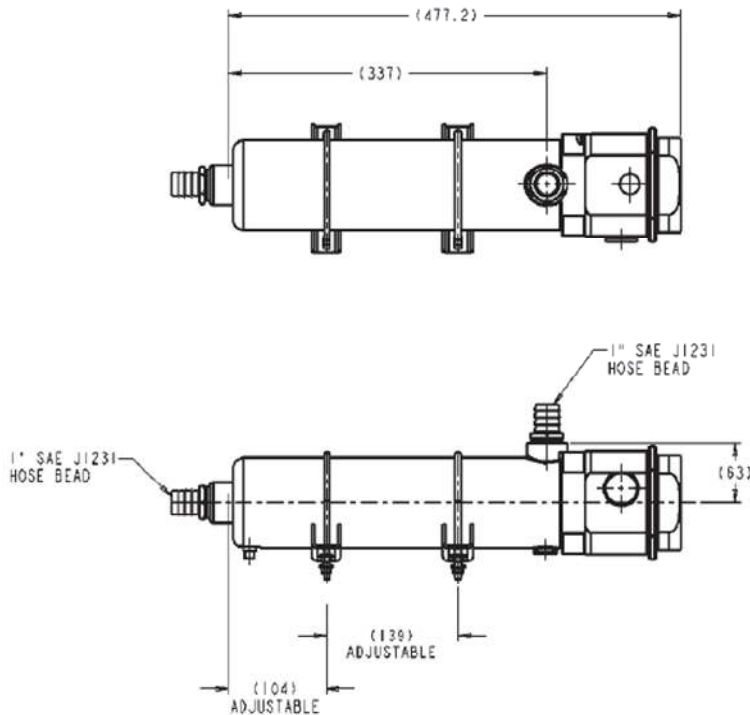
FEATURES

FACTORY INSTALLED

- Complete with silicone hoses
- Isolated tank heater vibration and shock tested to extreme limits to guarantee durability
- Optimized location of the heater on the genset base for maximum coolant flow
- Remote pilot thermostat located on the engine for optimized power cycle efficiency is factory set to 100° F (37.8°C)
- Automatically disconnected when engine is running via a dedicated heater relay located in the control panel.
- Supplied with UL recognized components
- Compatible with Cat® ELC and all chemicals
- All parts are serviceable and field replaceable
- Incoloy heater element for longer service life

Unit Specifications			
	Design Voltage		
	208 V	220 V	240 V
Rating	2250 W	2520 W	3000 W
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Phase	1	1	1
Amps	10.82	11.45	12.5
Feature Code	JWH0059/JWH00573		

HEATER DETAILS



HEATER OPERATION

The heater uses compliant components to UL and CSA, and is both CSA and UL approved.

When the generator set is not running, the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal, the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed and the engine has stopped.

Pilot thermostat located on the engine precisely monitors and controls the engine coolant temperature and is wired to energize and de-energize heater power cycles.

A high-limit thermostat is built into the heater to regulate the output temperature to within safe limits.

GCCP 1.2

Control Panel



Image shown may not reflect actual configuration.

GCCP 1.2 – Control Panel

GCCP 1.2 is an Auto Start Control Module suitable for a wide variety of diesel gen-set applications. Monitoring an extensive number of engine parameters, the modules will display warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LEDs and remote PC.

Description

The controller is compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer an extensive number of flexible inputs, outputs and extensive engine protections so the system can be easily adapted to meet the most demanding industry requirements.

The extensive list of features includes enhanced event and performance monitoring, remote communications & PLC functionality. The modules can be easily configured using a configuration suite PC software.

Full Range of Attachments

- Wide range of system expansion attachments, designed specifically to work with the GCCP controller
- Flexible packaging options for easy and cost effective installation

Benefits

- Hours counter provides accurate information for monitoring and maintenance periods
- User-friendly set-up and button layout for ease of use
- Multiple parameters are monitored & displayed simultaneously for full visibility
- The module can be configured to suit a wide range of applications for user flexibility
- PLC editor allows user configurable functions to meet user specific application requirements
- RS485 Communication port can be used for the Remote Monitoring Communication (Compatible with Cat PLG)

World Wide Product Support

- Cat dealers provide extensive pre and post sale support
- Cat dealers have over 1,600 dealer branch stores operating in 200 countries

Features

- 4-line back-lit LCD text display
- Multiple display languages
- Five-key menu navigation
- LCD alarm indication
- Customisable power-up text and images
- Data logging facility
- Internal PLC editor
- Protections disable feature
- Fully configurable via PC using USB & RS485 communication
- Front panel configuration with PIN protection
- Power save mode
- 3-phase generator sensing and protection
- Generator current and power monitoring (kW, kvar, kVA, pf) kW and kvar overload and reverse power alarms
- Over current protection
- Unbalanced load protection
- Breaker control via fascia buttons
- Fuel and start outputs configurable when using CAN Support for 0V to 10V & 4 mA to 20 mA sensors
- 8 Configurable digital inputs (3 available for Customer use)
- 8 Configurable digital outputs (5 available for Customer use)
- 4 Configurable analogue inputs (3 available for Customer use)
- CAN, MPU and alternator frequency speed sensing in one variant
- Real time clock
- Engine pre-heat and post-heat functions
- Engine run-time scheduler
- Engine idle control for starting & stopping
- Fuel usage monitor and low fuel level alarms
- 3 Configurable maintenance alarms
- MODBUS RTU support
- User configurable MODBUS pages

SPECIFICATIONS

DC SUPPLY

CONTINUOUS VOLTAGE RATING

8V to 35V continuous
5V for upto 1 minute

CRANKING DROPOUTS

Able to survive 0V for 100 mS, providing supply was at least 10V before dropout and supply recovers to 5V. This is achieved without the need for internal batteries.

LEDs and backlight will not be maintained during cranking

MAXIMUM OPERATING CURRENT

260 mA at 12V, 150 mA at 24V

MAXIMUM STANDBY CURRENT

145 mA at 12V, 85 mA at 24V

CHARGE FAIL/EXCITATION RANGE

0V to 35V

GENERATOR & MAINS (UTILITY) VOLTAGE RANGE

15V to 415 V AC (Ph to N)
26 V to 719 V AC (Ph to Ph)

MAGNETIC PICK-UP VOLTAGE RANGE

+/- 0.5 V to 70 V

FREQUENCY RANGE

10,000 Hz (max)

INPUTS

DIGITAL INPUTS A TO H

Negative switching

ANALOGUE INPUTS A TO D

Configurable as:

Negative switching digital input 0-10V sensor 4 mA to 20 mA
Resistive Sensor

ANALOGUE INPUTS A TO C

Configurable as:

Negative switching digital input Resistive Sensor

OUTPUTS

OUTPUT A and B (FUEL & START)

15 A DC at supply voltage

AUXILIARY OUTPUTS C, D, E, F, G, H, I & J 2

A DC at supply voltage

DIMENSIONS

OVERALL

216 mm x 158 mm x 43 mm
8.5" x 6.2" x 1.5"

PANEL CUTOUT

184 mm x 137 mm
7.2" x 5.3"

MAXIMUM PANEL THICKNESS

8 mm
0.3"

OPERATING TEMPERATURE

-30°C to +70°C
-22°F to +158°F

STORAGE TEMPERATURE RANGE

-40°C to +85°C
-40°F to +185°F

STANDARDS

UL, cUL Listed

NFPA 70#

Electro-Magnetic Compatibility: BS EN 61000-6-2/6-4 Electrical Safety: BS EN 60950

Temperature: BS EN 60068-2-1, BS EN 60068-2-2

Vibration: BS EN 60068-2-6

Humidity: BS EN 60068-2-30, BS EN 60068-2-78 Shock: BS EN 60068-2-27

Degrees of protection provided by enclosures: BS EN 60529 Ingress Protection: IP65 –
Front of module when installed into the control panel with the optional sealing gasket

Applicable codes and standards facilitate compliance to NFPA 70

OPTIONAL MODULES

Remote annunciator



The Remote annunciator with an integral sounder is an output LED expansion module designed to display a maximum of eight individual LED indications up to a maximum distance of 1 km (0.6 miles). The annunciator will consist of two modules to provide a 16 Channel Fault annunciation. The Panels are fitted with removable label cards which can be used to identify the standard NFPA alarms.

Key Features:

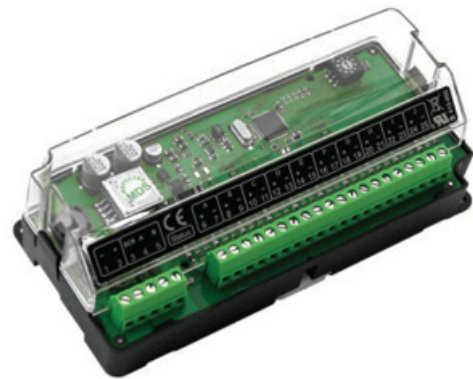
- Panel mount
- Vertical design
- In-built alarm
- Alarm mute button
- Max of 80 configurable LED's

Input Expansion Module

The Input Expansion module is used in conjunction with supported GCCP controllers to provide additional, flexible, input functionality. The module's ID switch is configurable from the module and the 10 inputs can be configured from within the 'host controller'. The inputs can be configured in a number of ways to connect to digital switches, resistive sensors, 0-10V DC signals or 4-20 mA signals.

Key Features:

- DIN rail & chassis mount
- Power on/link lost LED
- 1.2 km (0.75 Mile) working range
- Connect maximum of 4 x Input Modules to a single host controller
- Max of 40 configurable inputs



Output Expansion Module

The output relay expansion module for use with compatible GCCP control modules has been designed to extend a host module's output capabilities. A maximum of 10 relays can be connected to an individual module at any one time. All outputs are configurable via the host controller.

Key Features:

- Power On/Link Lost LED ID SWITCH
- 10 Expansion modules can be connected to 1 host controller at a time
- 8 Configurable relay contacts with LED indicators:
 - o 4 Normally Open (N/O)
 - o 4 Change Over (C/O)
- Terminal strip connection for quick and easy set-up



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LEHE2017-06 (02/25)

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GENERATOR SPACE HEATER



Generator Space Heater

for C13/C15/C18

Picture shown ☐ a ☐ not reflect actual configuration

GENERAL DESCRIPTION

Humidity is a natural enemy of generators and all electrical equipment.

Space heaters are design to protect generator windings from abnormally high humidity conditions when the generator is idle. The heater maintains the air around the windings at a suitable temperature to prevent winding corrosion due to condensation

Generator space heaters are electrical resistance heater and located within the generator stator housing. Space heaters are particularly recommended for generating located in a low ambient and/or high humidity environment. As a further benefit, space heaters provide an excellent method of drying out a generator after long transit or storage.

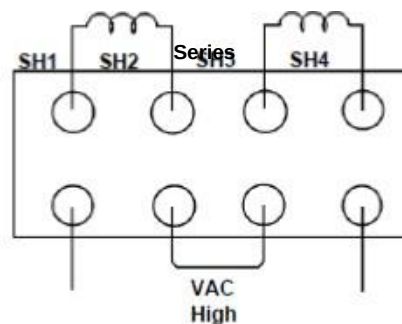
Because space heaters are required only during non-operative periods, they are require availability of a power source separate from the generator itself.

When the generating set is not running the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed.

The space heater for C13/C15/C18 generator sets uses one heating element. Heater element electrical data: Voltage – 120V/230V, Power - 150W / 250W*.

All space heaters are designed for 120 / 230 Volt operation (50 or 60 Hz) by making series connections at the terminal strip.

Space Heaters Connection Diagram



* for North American Region

LEHE1885-00 (02-19)

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Moulded Case Circuit Breakers:

100 A – 3000 A

200 kW – 750 kW Gensets

Features

- 100% UL Listing
- Electronic Trip Units
- Double insulation
- Clear indication of breaker status
- Can be used in normal operation in an ambient of -25°C and $+70^{\circ}\text{C}$
- Auxiliary contacts available
- Insulating case constructed from fiberglass reinforced synthetic resin
- Anti-corrosion treatment on all metal parts
- Optional 2 or 3 Circuit Breakers

Conformity with International Standards

Circuit Breakers have been designed to comply with these major standards:

- UL 489
- CSA22.2
- IEC 60947-2
- NEMA AB1

C9, C13, C15, C18 Circuit Breakers

Manually Operated Circuit Breakers

Current (A)	Frame	Number of Poles	Interrupting Ratings (kA ms)			Trip Unit	(Lugs) Cable Size Range / Phase	Auxilliary Options
			240V	480V	600V			
100	H	3	65	35	18	Electronic LSI	8-3/0 AWG	Form C (1 NO + 1 NC) Shunt Trip 24 VDC
250	J	3	65	35	18		(2) 3/0 – 250 kcmil	
400	XT5	3	65	35	18	Electronic LS/I (S or I) or LSI	(2) 2/0 – 500 kcmil	1 Form C + 1 Bell Alarm 60 VAC/VDC Shunt Trip 24 VDC
600	XT6	3	65	35	20		(3) 2/0 – 400 kcmil	
800	XT6	3	65	35	20		(3) 2/0 – 400 kcmil	
1200	XT7	3	65	50	25		(4) 4/0 – 500 kcmil	1 Form C + 1 Bell Alarm Shunt Trip 24 VAC/VDC
1600	T8	3	65	35	18	Electronic LSI	BUS BAR	Form C (1 NO + 1 NC) Shunt Trip 24 VDC
2000	T8	3	65	35	18		BUS BAR	
2500	T8	3	65	35	18		BUS BAR	
3000	T8	3	65	35	18		BUS BAR	

Electrically Operated Circuit Breakers

Current (A)	Frame	Number of Poles	Interrupting Ratings (kA ms)			Trip Unit	(Lugs) Cable Size Range / Phase	Auxilliary Options
			240V	480V	600V			
800	XT7M	3	65	50	25	Electronic LSI	(4) 4/0 – 500 kcmil	2 Form C + 1 Bell Alarm 24 VDC
1200	XT7M	3	65	50	25	Electronic LSI	(4) 4/0 – 500 kcmil	2 Form C + 1 Bell Alarm 24 VDC
2000	T 8M-S	3	125	125	100	Electronic LSI	BUS BAR	2 Form C + 1 Bell Alarm 24 VDC
3000	T 8M-S	3	125	125	100	Electronic LSI	BUS BAR	2 Form C + 1 Bell Alarm 24 VDC

L-I Mode

- Long Time / Overload Protection, “L” has an adjustable trip threshold and adjustable time delay.
- Instantaneous Short Circuit Protection, “I” has an adjustable short circuit trip threshold and once exceeded will cause the circuit breaker to trip instantaneously.

L-S Mode

- Long Time / Overload Protection, “L” has an adjustable trip threshold and adjustable time delay.
- Short Circuit Protection, “S” has an adjustable short circuit trip threshold and adjustable time delay if necessary for coordinating with downstream loads.
- Instantaneous Short Circuit Protection, “I” is still included, but the threshold level is not adjustable and exists at a predetermined level.

Electronic L-S-I Trip Units

- Long Time/Overload Protection, “L” has an adjustable trip threshold and adjustable time delay.
- Short Circuit Protection, “S” has an adjustable short circuit trip threshold and adjustable time delay if necessary for coordinating with downstream loads.
- Instantaneous Short Circuit Protection, “I” has an adjustable short circuit trip threshold and once exceeded will cause the circuit breaker to trip instantaneously.

Single Breaker Options (250 – 3000A)

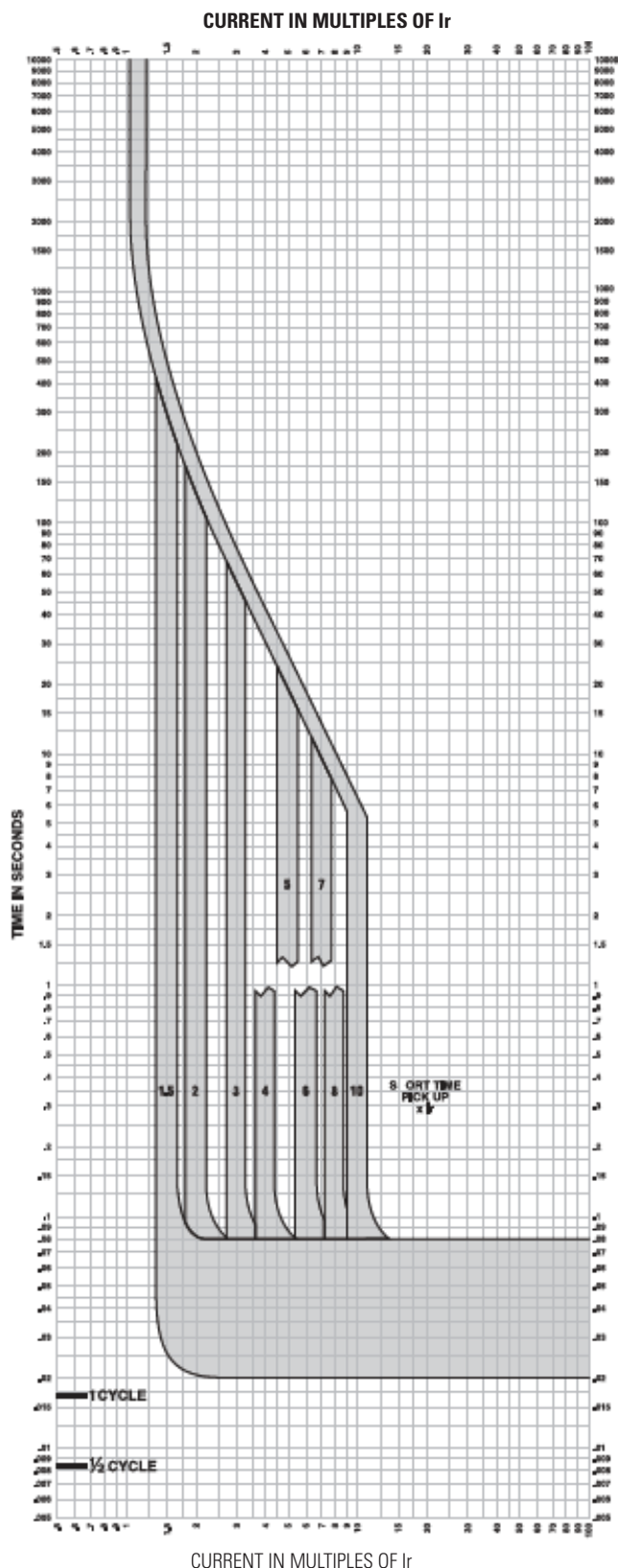
Model	Current (A)	Operation
C9	100	Manually Operated
C9	250	Manually Operated
C9	400	Manually Operated
C9 , C13 , C15 , C18	600	Manually Operated
C9 , C13 , C15 , C18	800	Manually Operated or Electrically Operated
C9 , C13 , C15 , C18	1200	Manually Operated or Electrically Operated
C13 , C15 , C18	1600	Manually Operated
C15 , C18	2000	Manually Operated or Electrically Operated
C18	2500	Manually Operated
C18	3000	Manually Operated or Electrically Operated

Multiple Breaker Options

Model	Main Breaker Box		Auxiliary Box Breaker (Amps) Manually Operated
	1st Breaker (Amps) Manually Operated	2nd Breaker (Amps) Manually Operated	
C9 , C13 , C15 , C18	100	100, 250, 400, 600, 800, or 1200	3rd Breaker: 100, 250 or 400 (Not available if 1st & 2nd Breaker = 1200A)
C9 , C13 , C15 , C18	250		
C9 , C13 , C15 , C18	400		
C9 , C13 , C15 , C18	600		
C9 , C13 , C15 , C18	800		
C9 , C13 , C15 , C18	1200		
C13 , C15 , C18	1600	Not Available	2nd Breaker: 100, 250 or 400
C15 , C18	2000		
C18	2500		
C18	3000		

H-Frame Circuit Breakers

Electronic Trip Unit Long Time/Short Time Trip Curve



Long Time/Short Time Trip Curve 60A, 100A, 150A H-Frame

The time-current curve information is to be used for application and coordination purposes only.

Notes

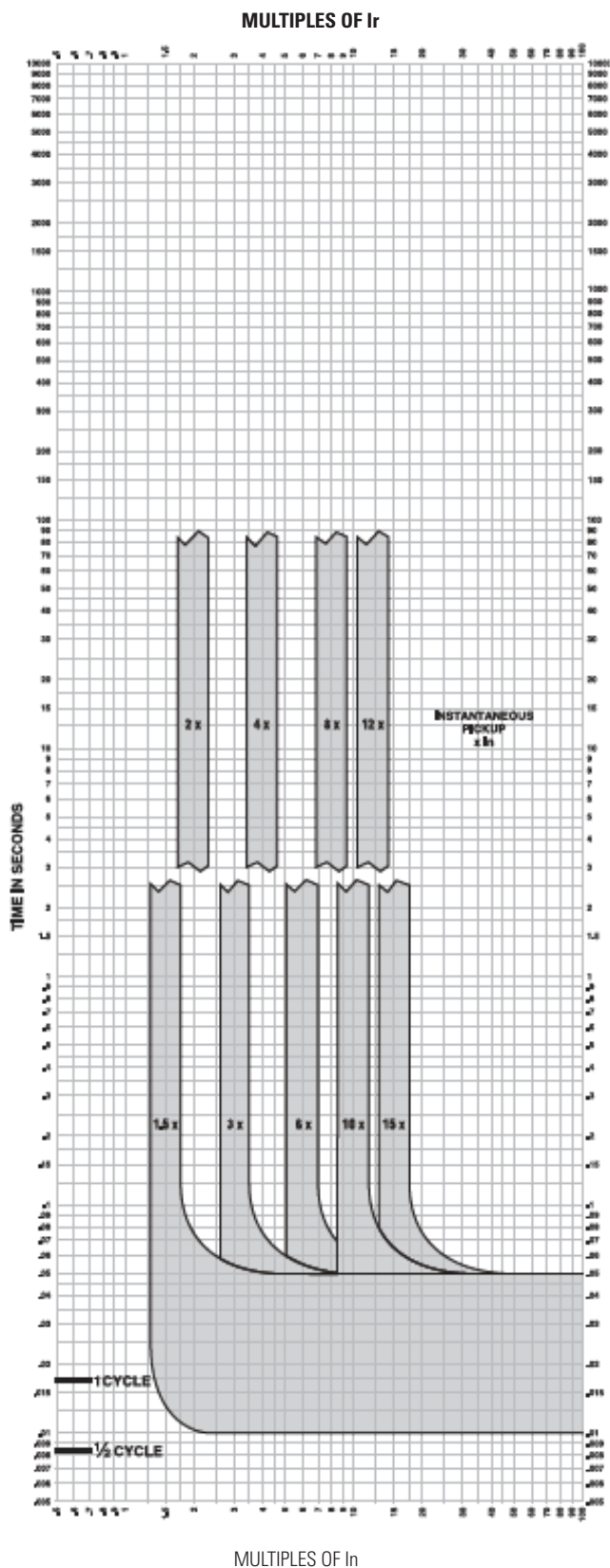
1. There is a thermal imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuitbreaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

Curves apply from -35°C to $+70^{\circ}\text{C}$ (-31°F to $+158^{\circ}\text{F}$) ambient temperature.

Figure 1

H-Frame Circuit Breakers

Electronic Trip Unit Instantaneous Trip Curve



Instantaneous Trip Curve 60A, 100A, 150A H-Frame

The time-current curve information is to be used for application and coordination purposes only.

Notes

1. There is a thermal imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. I_n = maximum dial setting of I_r .
 60A H-Frame: $I_n = 60A = \text{Max } I_r \text{ setting}$
 100A H-Frame: $I_n = 100A = \text{Max } I_r \text{ setting}$
 150A H-Frame: $I_n = 150A = \text{Max } I_r \text{ setting}$

Curves apply from -35°C to $+70^\circ\text{C}$ (-31°F to $+158^\circ\text{F}$) ambient temperature.

Figure 2

J-Frame 250 A Typical Peak Let-Through Curves

Electronic Mounded case Circuit Breakers J-Frame Current Limiting Circuit Breakers

250A – Frame at 240, 480 and 600V 3 phase

150-250A

Peak Let-Through Current I_p

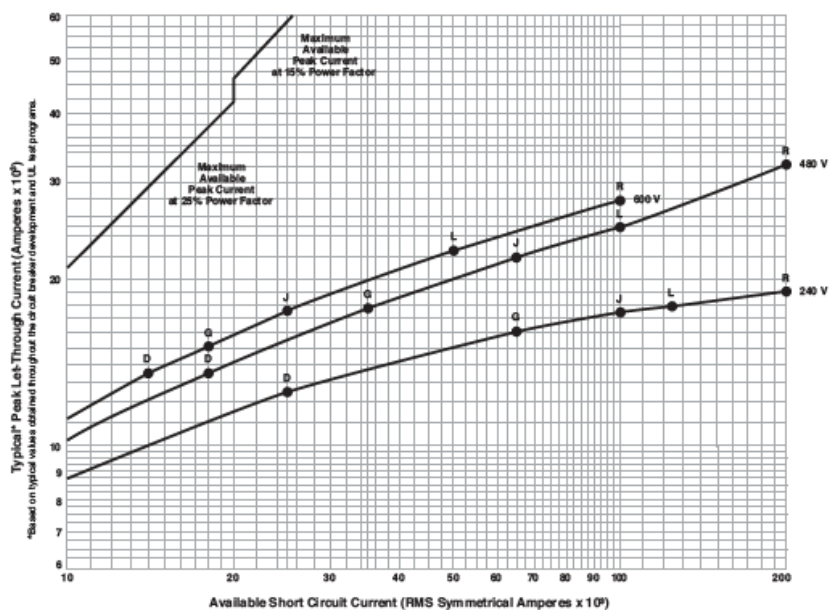


Figure 3

J-Frame 150-250A (JD, JG, JJ, JL, and JR) Thermal-Magnetic Trip

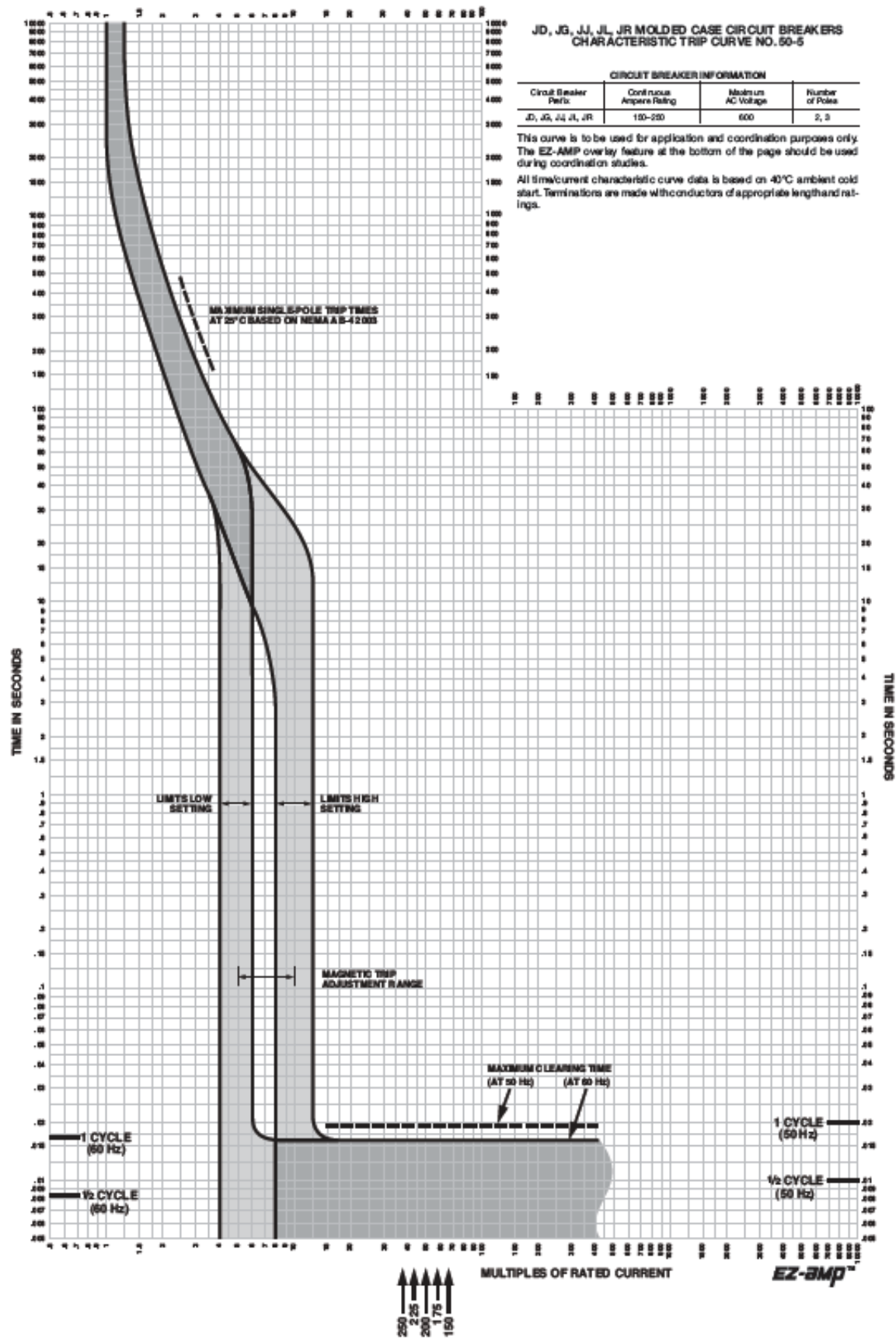


Figure 4

Ground Fault Module GFM250JD Trip Curve

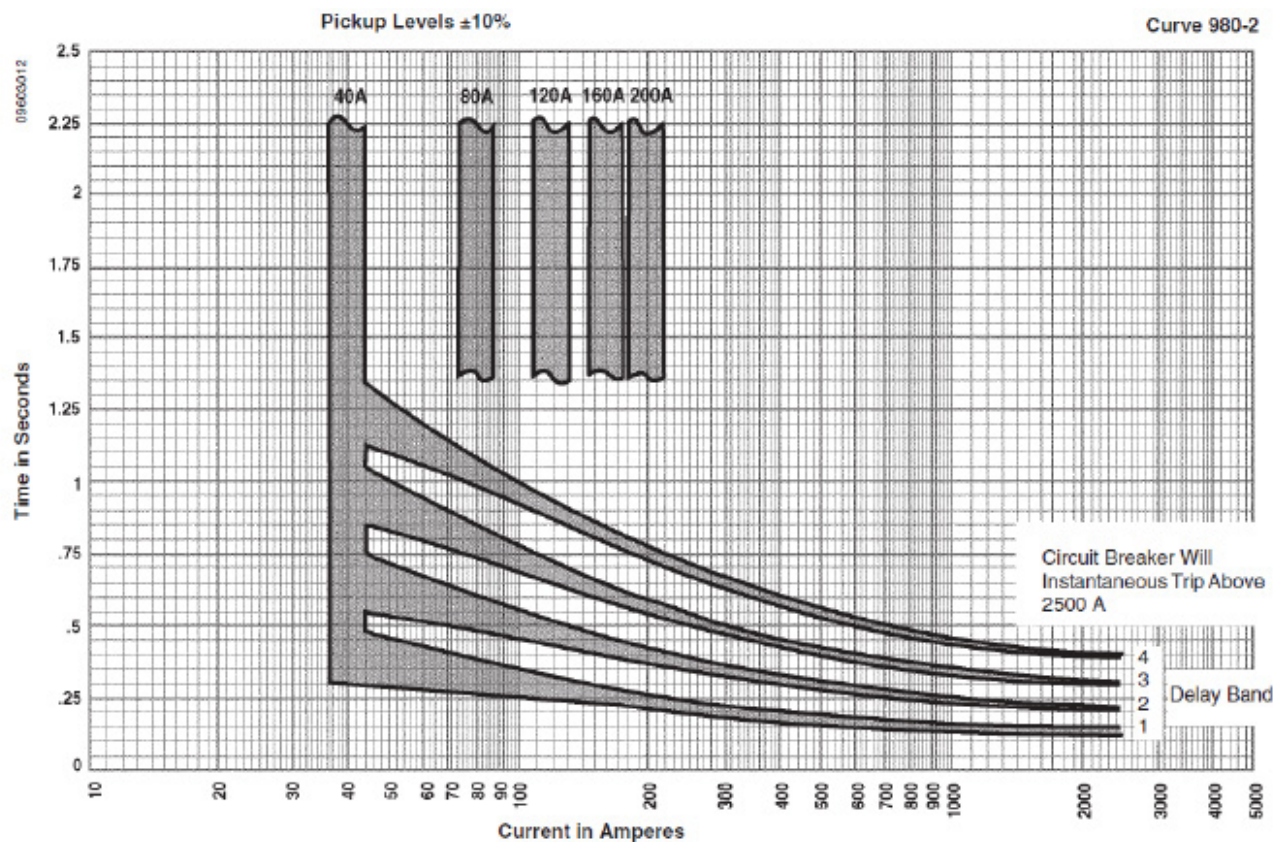
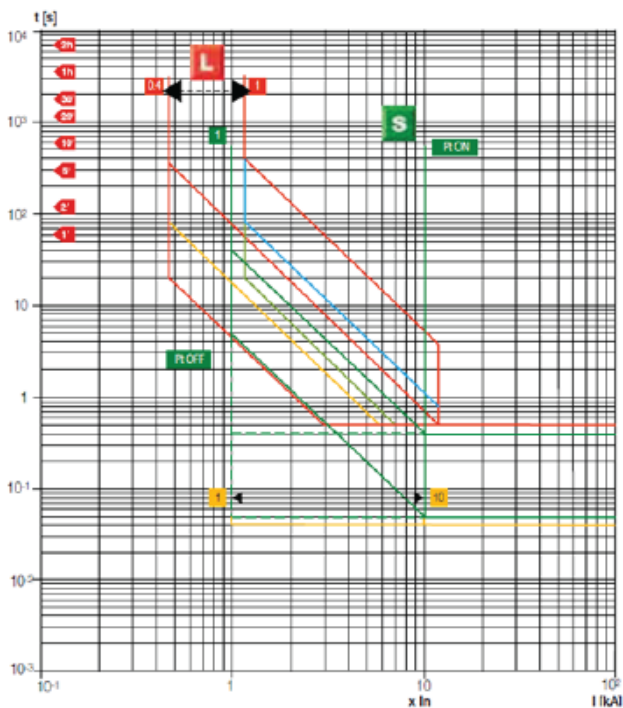


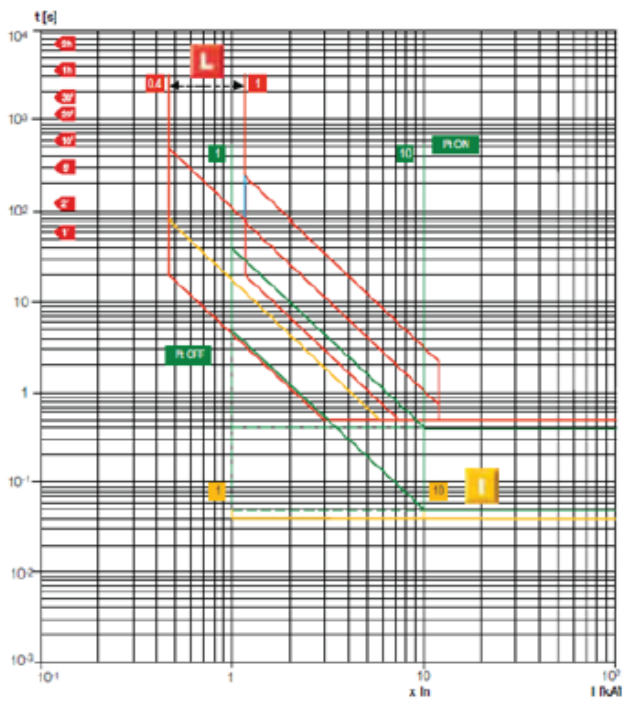
Figure 5

Trip Curves of Circuit Breakers

XT5 Ekip Dip LSI L-S-I Functions



XT6 Ekip Dip LSI L-S-I Functions



XT6 Ekip Dip LS/I L-S-I Functions

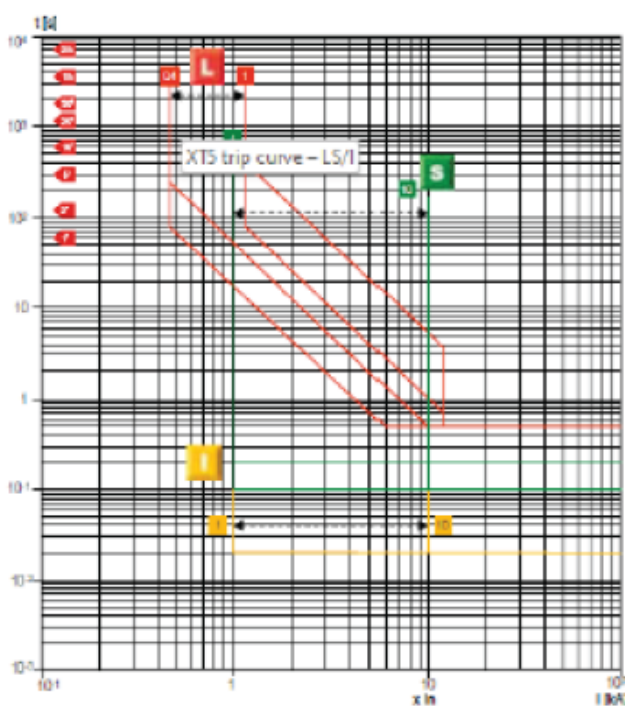


Figure 7

XT5 – XT6 Ekip Dip LS/I L-S-I Functions

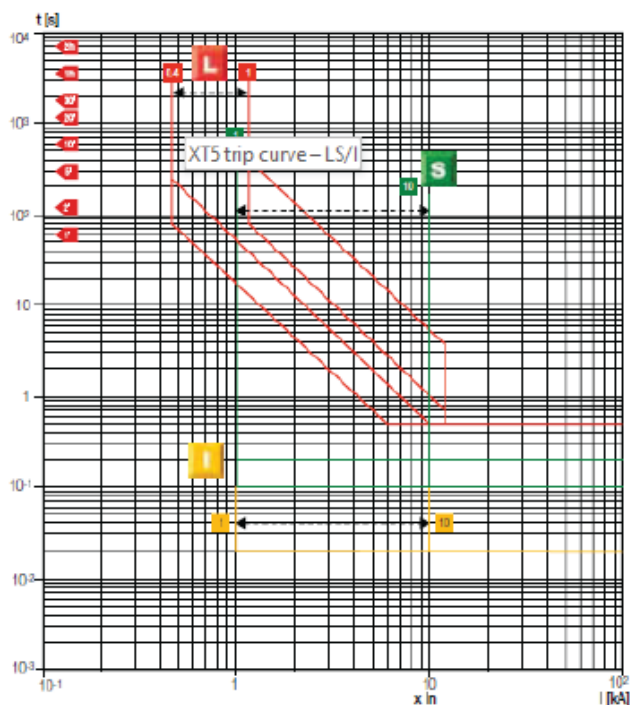
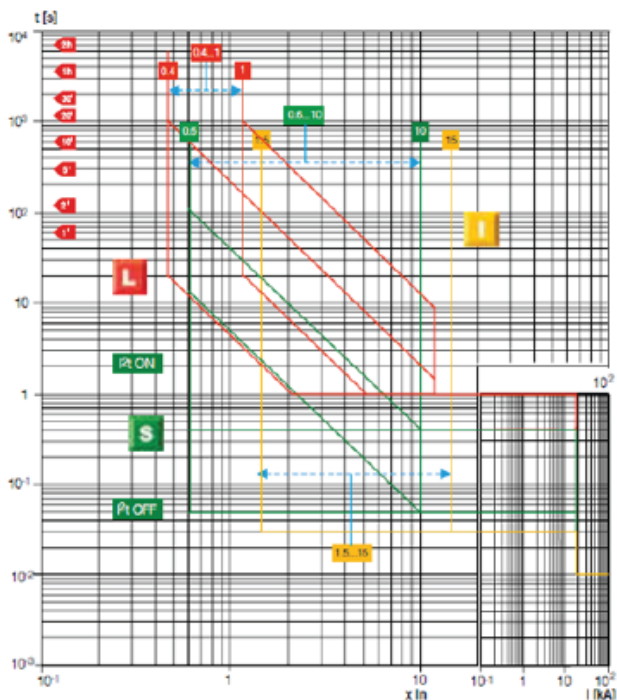


Figure 8

XT7 – XT7 M Ekip Dip LSI L-S-I Functions



XT7 – XT7 M Ekip Dip LS/I L-I Functions

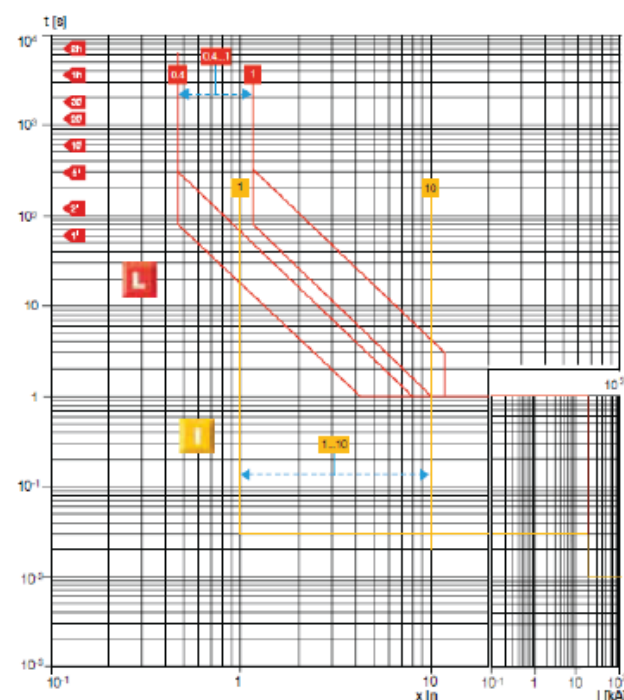


Figure 9

XT7 – XT7 M Ekip Dip LS/I L-S Functions

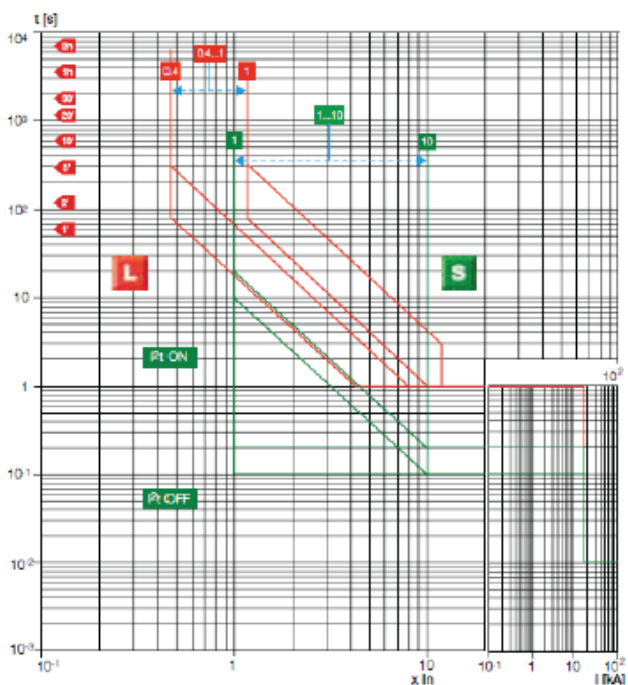


Figure 10

L-S-I Functions



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C13 / C15 / C18 Integral and Sub-Base Fuel Tanks

US Sourced
Diesel Generator Set
350 – 750 kW 60 Hz

Picture shown may not represent actual package.

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitates compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code
- Dual wall
- Lockable fuel fill cap, 4" (101.6 mm) NPT
- Low fuel level warning standard, customer configurable warning or shutdown
- Primary tank leak detection switch in containment basin
- Tank design provides capacity for thermal expansion of fuel
- Fuel supply dip tube is positioned so as not to pick up fuel sediment
- Fuel return and supply dip tube is separated by an internal baffle to prevent immediate re-supply of heated return fuel
- Pressure washed with an iron phosphate solution
- Interior tank surfaces coated with a solvent-based thin-film rust preventative
- Heavy gauge steel gussets with internal lifting rings
- Primary and secondary tanks are leak tested at 20.7 kPa (3 psi) minimum
- Compatible with open packages and enclosures
- Gloss black polyester alkyd enamel exterior paint
- Welded steel containment basin (minimum of 110% of primary tank capacity)
- Direct reading fuel gauge with variable electrical output
- Emergency vents on primary and secondary tanks are sized in accordance with NFPA 30

Sub-Base

- The Sub-Base fuel tank mounts below the generator set wide base

Integral

- Integral diesel fuel tank is incorporated into the generator set base frame
- Robust base design includes linear vibration isolators between tank base and engine generator

Options

- Audio/visual fuel level alarm panel
- 5 gal (18.9 L) spill containment
- 5 gal (18.9 L) spill containment with fuel fill drop tube with in 6" (152 mm) from bottom of tank
- 5 gal (18.9 L) spill containment with overfill prevention valve and fuel fill drop tube with in 6" (152 mm) from bottom of tank
- ULC Listed 7.5 gal (28.4 L) spill containment with vent extensions, vent whistle, and drop tube facilitating compliance with CSA B139-09
- ULC Listed 7.5 gal (28.4 L) spill containment with overfill prevention valve, vent extensions, vent whistle and drop tube facilitating compliance with CSA B139-09

Integral & Sub-Base Fuel Tank Base Useable Capacities with Fuel Tank Dimensions & Weights

Integral – Width (W) 2014 mm (79.3 in)

Sub-base – Width (W) 2056 mm (81.0 in)

Integral* – Width(W) 2315 mm (91.2 in)

Sub-base* – Width(W) 2357 mm (92.7in)

C13 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW013	2646	699	2540	671	1569	3450	762	30.0	5461	215	2552	100.5	2743	108.0
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW006	6980	1844	6818	1801	2228	4483	889	35.0	6184	243.5	3017	118.8	3209	126.3
Sub-Base	FTDW007	8339	2203	8244	2178	2150	5052	889	35.0	7074	278.5	2291	117.8	3789	149.2
Sub-Base	FTDW011	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2763	108.8	2955	116.3

C15 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW002	1283	339	1262	333	1015	2237	635	25.0	3814	150.1	2426	95.5	2619	103.0
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW006	6980	1844	6818	1801	2228	4912	889	35.0	6184	243.5	3017	118.8	3209	126.3
Sub-Base	FTDW008	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2763	108.8	2955	116.3
Sub-Base	FTDW034	10887	2876	9899	2615	2847	6277	914	36	7747	305	3043	119.8	3233	127.3

C18 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW004	1446	382	1422	376	1015	2237	635	25.0	3814	150.1	2426	95.5	2560	100.8
Integral*	FTDW030	2498	660	2381	629	1681	3703	762	30.0	4995	196.6	2670	105.1	2675	105.3
Integral*	FTDW031	5175	1367	4997	1320	2046	4510	762	30.0	6737	265.3	2670	105.1	2675	105.3
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW007	8339	2203	8244	2178	2150	4134	889	35.0	7074	278.5	2291	117.8	3159	124.4
Sub-Base	FTDW008	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2739	107.9	2905	114.4
Sub-Base*	FTDW032	10228	2702	10112	2640	2638	5816	889	35.0	7368	290	3127	123.1	3132	123.3

*For Ratings 650, 700 & 750 kW only

Integral & Sub-Base Fuel Tank Base Useable Capacities with Fuel Tank Dimensions & Weights

Integral - Width(W) 2014 mm (79.3 in)

Sub-base - Width(W) 2056 mm (81 in)

Integral* - Width(W) 2315 mm (91.2 in)

Sub-base*-Width(W) 2357 mm (92.7in)

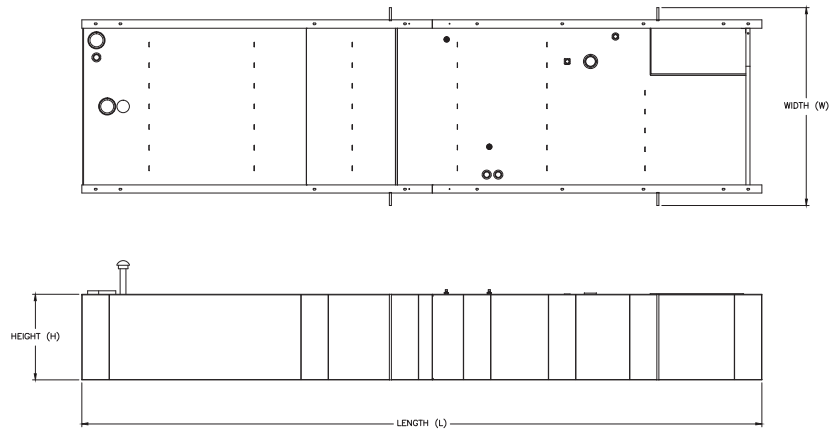
Sound Attenuated Enclosure

C13 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW013	2646	699	2540	671	1569	3450	762	30.0	5461	215.0	NA	NA	2743	108.0
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	NA	NA	2955	116.3
Sub-Base	FTDW006	6980	1844	6818	1801	2033	4483	889	35.0	6184	243.5	NA	NA	3209	126.3
Sub-Base	FTDW007	8339	2203	8244	2178	2292	5052	889	35.0	7074	278.5	NA	NA	3209	126.3
Sub-Base	FTDW011	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	NA	NA	2955	116.3

C15 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW001	1283	339	1262	333	1015	2237	639	25.0	4746	186.9	NA	NA	2619	103.0
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	NA	NA	2955	116.3
Sub-Base	FTDW006	6980	1844	6818	1801	2228	4912	889	35.0	6184	243.5	NA	NA	3209	126.3
Sub-Base	FTDW011	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	NA	NA	2955	116.3
Sub-Base	FTDW034	10887	2876	9899	2615	2847	6277	914	36	7747	305	NA	NA	3233	127.3

C18 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW003	1446	382	1422	376	1015	2237	635	25.0	3814	150.1	NA	NA	2560	100.8
Integral*	FTDW030	2498	660	2381	629	1681	3703	762	30.0	4995	196.6	2670	105	2675	105.3
Integral*	FTDW031	5175	1367	4997	1320	2046	4510	762	30.0	6737	265.3	NA	NA	2675	105.3
Sub-Base	FTDW005 / FTDW016	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	NA	NA	2905	114.3
Sub-Base	FTDW007	8339	2203	8244	2178	2150	4134	889	35.0	7074	278.5	NA	NA	3209	126.3
Sub-Base	FTDW011	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	NA	NA	2905	114.3
Sub-Base*	FTDW032	10228	2702	9994	2640	2638	5816	889	35.0	7368	290	NA	NA	3132	123.3

*For Ratings 650, 700 & 750 kW only



The heights listed above do not include lumber used during manufacturing and shipping.

Estimated Run Times (Hours) at 100% Load

C13 Tank Design	Feature Code	Standby Ratings (ekW)				Prime Ratings (ekW)			
		400	350	—	—	350	320	—	—
Integral Tank	FTDW013	24	27	—	—	25	29	—	—
Sub-Base	FTDW005 / FTDW016	36	41	—	—	38	43	—	—
Sub-Base	FTDW006	65	72	—	—	72	77	—	—
Sub-Base	FTDW007	77	87	—	—	81	93	—	—
Sub-Base	FTDW011	23	25	—	—	24	27	—	—

C15 Tank Design	Feature Code	Standby Ratings (ekW)				Prime Ratings (ekW)			
		500	450	400	350	455	410	365	320
Integral Tank	FTDW001 / FTDW002	9	9	11	11	10	10	11	12
Sub-Base	FTDW005 / FTDW016	28	29	32	36	30	31	35	38
Sub-Base	FTDW006	50	52	57	63	54	56	62	67
Sub-Base	FTDW008 / FTDW011	17	18	20	22	19	20	22	24
Sub-Base	FTDW034	72	75	82	91	78	81	90	97

C18 Tank Design	Feature Code	Standby Ratings (ekW)					Prime Ratings (ekW)				
		750	700	650	600	550	680	635	600	545	500
Integral	FTDW003 / FTDW004	—	—	—	8	9	—	—	—	9	10
Integral*	FTDW030	11	12	13	—	—	12	13	14	—	—
Integral*	FTDW031	24	25	27	—	—	26	27	29	33	36
Sub-Base	FTDW005 / FTDW016	—	—	—	24	25	—	—	—	25	27
Sub-Base	FTDW007	—	—	—	51	54	—	—	—	54	59
Sub-Base	FTDW008 / FTDW011	—	—	—	15	16	—	—	—	16	17
Sub-Base*	FTDW032	49	51	54	—	—	53	55	58	—	—

*For Ratings 650, 700 & 750 ekW only

Tanks with full electrical stub-up area include removable end channel. Tanks with RH stub-up include stub-up area directly below the circuit breaker or power terminal strips. Dimensions include weather-protective enclosure exhaust system.

Dual wall sub-base tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks and applicable options facilitate compliance with the following United States NFPA Code and Standards:

NFPA 30: Flammable and Combustible Liquids Code

NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks and applicable options facilitate compliance with the following Canadian Standard and Code:

CSA C282 – Emergency Electrical Power Supply for Buildings

CSA B139-09 - Installation Code for Oil-Burning Equipment

The following sub-base fuel tanks meet Chicago code for containment and labelling:

FTDW005

FTDW008

FTDW011



Image shown may not reflect actual configuration

Features

- Designed for full flow until reaching the shutoff level
- Accepts 2" NPT drop tube, as required, to meet local jurisdiction codes
- Immediate and cushioned shutoff eliminates line shock
- Full flow up to within seconds of valve closure
- Integrated bleed hole prevents siphoning through the valve and allows less than 2% of the maximum flow to relieve fill line pressure so the fill nozzle can be disconnected without spilling product.
- Valve operates on simple mechanics with minimal moving parts. Shutoff is activated by basic hydraulic principles.
- Adjustable float
- 2" female threads x 4" female threads

Construction Details

- Adaptor: aluminum (hard-coat anodized)
- Body: anodized aluminum
- Valve: weight 12.5 lbs.
- Float: Nitrophyl-N
- Plunger and dashpot: aluminum (hard-coated)
- Upper tube and float guard: E-coated steel
- Shutoff mechanism: stainless steel

Overfill Prevention Valve for Use with 5 Gallon Spill Containment

The overfill prevention valve is installed at the fill port of a fuel tank.

Used in a pressurized tight fill application, the valve helps prevent tank overfills by closing when the liquid level reaches a pre-set warning level 95% full.

The valve is installed through a 4" threaded opening and has a built-in bleed hole that allows the fill hose pressure to be relieved after the valve closes. This bleed hole also provides anti-siphon protection for the valve.

Product Warnings and Cautions

- 5 psi and 5 gpm is the minimum flow requirement for valve operation. Valve will NOT function in gravity fill applications.
- Maximum viscosity of 300 centistokes.
- Estimated flow rate of 175 gpm at 10 psi pressure drop
- The maximum operating pressure is 100 psi.
- Once closed the valve will allow flow of less than 2% of max flow to relieve fill line pressure.
- A tight fill is required for the valve to operate. Do not substitute any other fill adaptors for the special adaptor supplied.
- The valve must be used with clean product. Debris from products such as contaminated used oil may cause the valve to function improperly.

Code Compliance

- NFPA 30, 30A, UFC, IFC, and PEI/RP200

Dimensions

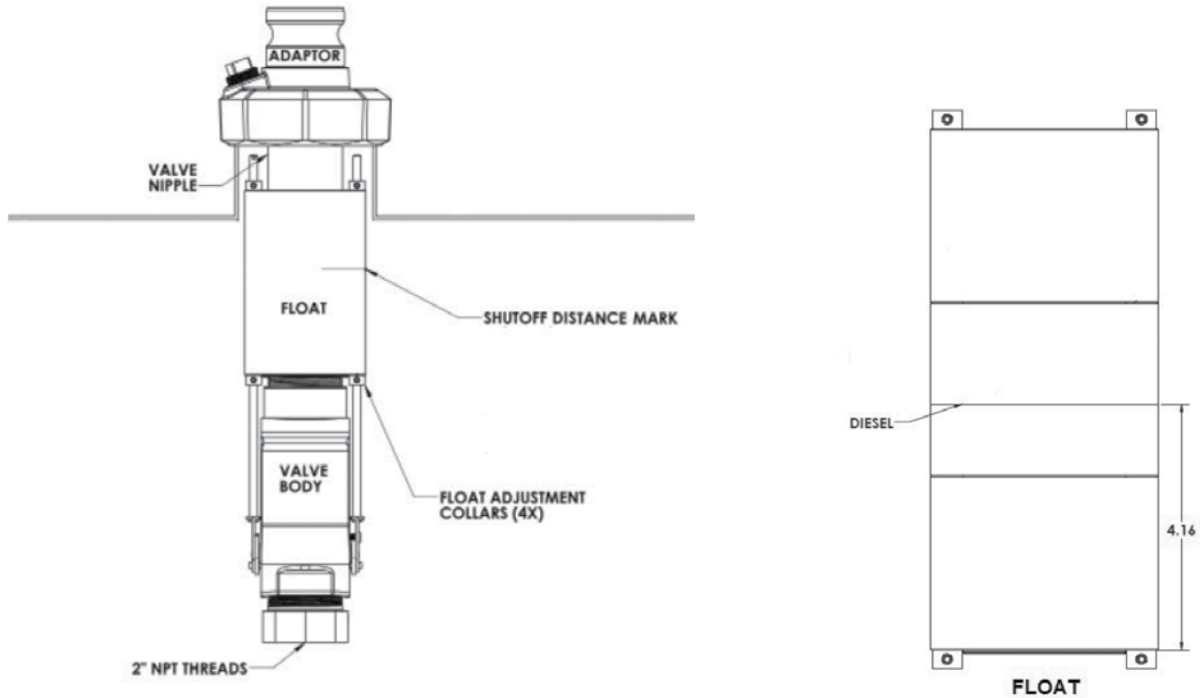


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It is important to select correct Cellular Band based on ship to country. Click on the image below to know if the desired Product Link device is available for the region of use.

Note:

REST OF THE WORLD BAND (ROW_I) / PL444 (EU) – Certified for Europe, Africa, Middle East, & Asia Pacific regions

It is important to confirm carrier coverage for the specific geographic region prior to installing cellular devices whether or not a carrier includes data coverage. Roaming carriers for the Product Link cellular devices can be found on dealer.cat.com/PL under Sales Support.

TELEMATICS HARDWARE

Show in Dropdown

NO PRODUCT LINK GEN CELLULAR (PLGNONE_I) 0.00 USD

PRODUCT LINK 4G LTE TELEMATICS (PL444_I) 0.00 USD

CELLULAR BAND

Show in Dropdown

REST OF THE WORLD BAND (ROW_I) 0.00 USD

AMERICAS BAND (AM_I) 0.00 USD

For further support on proper cellular band/radio selection, please contact your local Caterpillar Industry representative.

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It is important to select correct Cellular Band based on ship to country. Click on the image below to know if the desired Product Link device is available for the region of use.

AMERICAS BAND (AM I) / PL444 (NA) – Certified for North, Central, & South America regions

ELECTRONICS EQUIPMENT CERTIFICATION

Developed by: [ICS Data Solutions](#)

Certification Equipment:

Product Link

Certification Table Updated:

1/18/2023

Equipment Type:

Equipment Type, Model

- ☐ Search
- ☐ Command
- ☐ Entertainment Radios
- ☐ Grade Control
- ☒ Product Link
- ☐ Radar
- ☐ Tech Hardware
- ☐ Tire Monitoring System

Geography

Continent, Country

- ☒ Search
- ☐ (Blank)
- ☐ Africa
- ☐ Antarctica
- ☐ Asia
- ☐ Europe
- ☒ North America
- ☐ Oceania
- ☐ South America

Country Certifications 1

Model	PL444 (NA)	PL444 (EU)	PL083	PL243	PLG641
Model Type	Cell/BLE	Cell/BLE	Sat/Cell	Cellular	Cellular
Part Number					
Miquelon	Not Certified	Complete	Complete	Complete	Obsolete
Montserrat	Not Certified	Not Certified	Not Certified	Not Certified	Not Certified
Nicaragua	Complete	Not Certified	Complete	Complete	Not Certified
Panama	Complete	Complete	Complete	Complete	Complete
Puerto Rico	Complete	Not Certified	Complete	Complete	Obsolete
St. Barts	Not Certified	Complete	Complete	Complete	Obsolete
St. Kitts & Nevis	Not Certified	Not Certified	Not Certified	Complete	Not Certified
St. Lucia	Not Certified	Not Certified	Not Certified	Complete	Not Certified
St. Martin (French)	Not Certified	Complete	Complete	Complete	Obsolete
St. Pierre	Not Certified	Complete	Complete	Complete	Obsolete
St. Vincent & Grenadines	Not Certified	Not Certified	Not Certified	Complete	Not Certified
Trinidad and Tobago	Complete	Not Certified	Complete	Complete	Obsolete
Turks & Caicos	Not Certified	Not Certified	Not Certified	Complete	Not Certified
United States	Complete	Not Certified	Complete	Complete	Obsolete
United States Virgin Islands	Complete	Not Certified	Complete	Complete	Obsolete

Click and Drag to Move, scroll to Zoom

NOTE: It's important to confirm carrier coverage for the specific geographic region prior to installing cellular devices including whether or not a carrier includes data coverage. Roaming carriers for the Product Link cellular *Antennas* can be found on dealer rat card (R) under Sales, Support

CSQ Screen indicating selection of “Cellular Band”:

TELEMATICS HARDWARE

Show in Dropdown

NO PRODUCT LINK GEN CELLULAR (PLGNONE_I) 0.00 USD

PRODUCT LINK 4G LTE TELEMATICS (PL444_I) 0.00 USD

CELLULAR BAND

Show in Dropdown

REST OF THE WORLD BAND (ROW_I) 0.00 USD

AMERICAS BAND (AM_I) 0.00 USD

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Pump Style Jacket Water Heater

Image shown may not reflect actual package.

Single Phase 1000 Watts Pump style jacket water heater is a complete coolant reheater. It features an integrated pump that combines the benefits of forced circulation with a compact design that can mount to a variety of small engine applications. Forced circulation of the coolant delivers uniform heating throughout the entire engine—extends element life and offers a significant reduction in electrical consumption.

UL Listed ETL Listed

1000W

Installation provided with shut-off valves

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Remote Emergency Stop Button

Image shown may not reflect actual configuration.

Features and Benefits

- Enclosure degree of protection – IP 69K (NEMA 6)
- UL Listed (NKCR)
- Assembled enclosure with shroud
- 40 mm mushroom emergency stop
- Twist release
- 2NC – horizontally mounted

Dimensions

- Net Width: 0.065 m
- Net Height: 0.078 m
- Net Depth: 0.065 m
- Net Weight: 0.124 kg

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Pump Style Jacket Water Heater

Image shown may not reflect actual package.

Single Phase 1000 Watts Pump style jacket water heater is a complete coolant reheater. It features an integrated pump that combines the benefits of forced circulation with a compact design that can mount to a variety of small engine applications. Forced circulation of the coolant delivers uniform heating throughout the entire engine—extends element life and offers a significant reduction in electrical consumption.

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1000W

Installation provided with shut-off valves

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Image shown may not reflect actual configuration.

20A Tamper-Resistant, Weather-Resistant GFCI Receptacles

Features and Benefits

- Automatically tests the GFCI every time the reset button is pushed in. The GFCI will not reset if the GFCI circuit is not functioning properly.
- By blocking reset of the GFCI if protection has been compromised, SmartLockPRO reduces the possibility of end-users incorrectly assuming that a reset GFCI outlet is providing ground fault protection when it actually is not.
- A line-load reversal diagnostic feature is provided which prevents the GFCI from being reset and stops power from being fed to the GFCI receptacle face or through to downstream devices. A green LED indicator on the GFCI's face also illuminates to alert the installer to the line-load wiring reversal.

Weather-Resistant GFCIs

- Meet UL 498 requirements for weather-resistant receptacles.

Tamper-Resistant GFCIs

- Shutter mechanism inside the receptacle blocks access to the contacts unless a two-prong plug is inserted, helping ensure foreign objects will be locked out.

Product Features

- Grounding: GFCI ground fault
- Feature: Weather and tamper-resistant
- Amperage: 20 Amp
- Voltage: 125 Volt
- NEMA: 5-20R
- Trip Level: Class A, 5mA plus or minus 1mA
- Pole: 2
- Wire: 3
- Color: White

Standards and Certifications

- NEMA: WD-6
- ANSI: C-73
- UL498: File E13399
- CSA C22.2 No. 42: File LR-57811
- NOM: 057
- UL 943: File E48380

Receptacles contained in a
weather resistant box
and in-use cover.



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125 Amp Load Center



Image shown is a not reflect actual packaging.

SPECIFICATIONS

Line Rated Current	125
Number of spaces	12
Number of circuits	24
Number of tandem circuit breakers	12
System voltage	120/240 V AC
NEMA degree of protection	NEMA 3R outdoor
Electrical connection	Lugs
Wiring configuration	1-wire
Material	Tin plated aluminum busbar
Enclosure material	Galvanized steel
Coat finish	Grain coated enamel
Product certifications	UL Listed

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APPENDIX F

SEPA Environmental Checklist Form

SEPA¹ Environmental Checklist

Purpose of checklist

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. **You may use “not applicable” or “does not apply” only when you can explain why it does not apply and not when the answer is unknown.** You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to **all parts of your proposal**, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for lead agencies

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the Supplemental Sheet for Nonproject Actions (Part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in “Part B: Environmental Elements” that do not contribute meaningfully to the analysis of the proposal.

¹ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Checklist-guidance>

A. Background

[Find help answering background questions](https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-A-Background)²

1. Name of proposed project, if applicable:

Rocky Reach Dam Emergency Generator Replacement

2. Name of applicant:

Chelan County PUD (CCPUD)

3. Address and phone number of applicant and contact person:

Alex White, CCPUD Permit Coordinator

PO Box 1231

Wenatchee, WA 98807

(509) 661-8148

4. Date checklist prepared:

April 1, 2026

5. Agency requesting checklist:

Dept. of Ecology – Central Regional Office

6. Proposed timing of schedule (including phasing, if applicable):

Installation of the new emergency generator would occur in the fall of 2026.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

None.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Emissions Calculations have been prepared by Geosyntec for the Notice of Construction Application that includes an Ambient Air Quality and Toxic Analysis and an evaluation of Best Available Control Technology to demonstrate Emission Standard Compliance.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

This SEPA Checklist covers the requirements of the Dept. of Ecology Central Regional Office for the installation of a new backup generator at the Rocky Reach Dam.

10. List any government approvals or permits that will be needed for your proposal, if known.

NOC approval from the Dept. of Ecology.

² <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-A-Background>

- 11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

Chelan PUD is proposing to replace the existing Cummins 300 kW diesel fired emergency generator at the Rocky Reach Dam facility with a new Caterpillar C18 In-line, 4-cycle diesel 750 kW generator. This project includes the removal of the existing generator and the Installation of the new diesel generator and all necessary modifications to supplement black start capabilities at the Chelan County PUD Rocky Reach facility. The other equipment being installed along with the new generator includes the supporting low voltage switchgear.

Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

This project takes place at the Rocky Reach Dam on Parcel #24-20-35-330-150. The site address is 5695 US Hwy 97A, Wenatchee, WA 98801.

B.Environmental Elements

1. Earth

[Find help answering earth questions³](https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-earth)

- a. General description of the site:**

The site consists of the Rocky Reach Dam that is operated by Chelan PUD.

Circle or highlight one: **Flat**, rolling, hilly, steep slopes, mountainous, other:

- b. What is the steepest slope on the site (approximate percent slope)?**

The site is flat with the steepest slope being approximately 2-3%.

- c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.**

According to NRCS soil mapping data, soil on site consists of Pogue gravelly fine sandy loam.

³ <https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-earth>

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

No indications or history of unstable soils are present.

- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**

No fill, excavation, or grading is proposed.

- f. Could erosion occur because of clearing, construction, or use? If so, generally describe.**

No erosion would occur due to generator installation.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

No new impervious surfaces would be developed since generator installation would occur on the existing Rocky Reach Dam.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any.**

None are proposed.

2. Air

[Find help answering air questions⁴](#)

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.**

The amounts of particulate matter and CO₂ would be temporarily higher during construction. These temporary increases in emission release are due to the activity of the construction equipment required to transport materials and personnel. Post-construction, particulate matter and CO₂ are expected to return to their pre-construction levels.

Emissions to the air would also be produced from the generator running. Please see the detailed report by Geosyntec titled Notice of Construction NOC Application, dated March 27, 2026 (included in this submittal).

Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

⁴ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-Air>

b. Proposed measures to reduce or control emissions or other impacts to air, if any:

To limit particulate matter and CO₂ creation during removal of the existing generator and installation of the new generator, equipment and vehicles would comply with Washington State emission standards. Chelan PUD would require construction vehicles to be maintained in good working order and not allowed to continuously idle when not in use. Vehicles would be inspected regularly and be taken out of use if they are creating excessive smoke, fumes, or exhaust.

No measures are proposed for when the new generator is operating; however, Chelan PUD would perform any necessary maintenance to ensure that it is working correctly.

3. Water

[Find help answering water questions](#)⁵

a. Surface:

[Find help answering surface water questions](#)⁶

- 1. Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

The Columbia River is adjacent to this project.

- 2. Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

Installation of the backup generator would occur within 200 feet of the river; however, installation would occur on top of the surface of the Rocky Reach Dam.

- 3. Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

No fill placement or dredging would occur as a result of the proposed project.

- 4. Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.**

The proposed project would not require surface water withdrawals or diversions.

⁵ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water>

⁶ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Surface-water>

- 5. Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

The location that the proposed generator would be installed is within the 100-year floodplain on the surface of the Rocky Reach Dam.

- 6. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

No discharge of waste materials would occur as a result of the proposed project.

b. Ground:

[Find help answering ground water questions⁷](#)

- 1. Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.**

No groundwater would be withdrawn for the proposed project.

- 2. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

No waste material would be discharged into the ground for the proposed project.

c. Water Runoff (including stormwater):

- 1. Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

The backup generator pad would replace existing paved surfaces; therefore, the amount and location of discharge of water runoff would remain unchanged from existing site conditions.

- 2. Could waste materials enter ground or surface waters? If so, generally describe.**

No, please see the generator specifications included with this submittal describing the added safety measures for containment of waste material.

- 3. Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

No.

⁷ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Groundwater>

- c. **Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:**

Since the impervious areas are not changing, there are no measures proposed to reduce runoff.

4. Plants

[Find help answering plants questions](#)

- a. **Check the types of vegetation found on the site:**

- ☐ **deciduous tree: alder, maple, aspen, other**
- ☐ **evergreen tree: fir, cedar, pine, other**
- ☐ **shrubs**
- ☐ **grass**
- ☐ **pasture**
- ☐ **crop or grain**
- ☐ **orchards, vineyards, or other permanent crops.**
- ☐ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**
- ☐ **water plants: water lily, eelgrass, milfoil, other**
- ☒ **other types of vegetation**

- b. **What kind and amount of vegetation will be removed or altered?**

None

- c. **List threatened and endangered species known to be on or near the site.**

None known.

- d. **Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any.**

None proposed.

- e. **List all noxious weeds and invasive species known to be on or near the site.**

None known.

5. Animals

[Find help answering animal questions](#)⁸

- a. **List any birds and other animals that have been observed on or near the site or are known to be on or near the site.**

⁸ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-5-Animals>

Examples include:

- **Birds:** hawk, heron, eagle, songbirds, other:
- **Mammals:** deer, bear, elk, beaver, other:
- **Fish:** bass, salmon, trout, herring, shellfish, other:

b. List any threatened and endangered species known to be on or near the site.

No threatened or endangered species are known to be on or near the subject property.
There are listed salmon runs that occur in the Columbia River.

c. Is the site part of a migration route? If so, explain.

The project site is within the Pacific Flyway migration route for birds.

d. Proposed measures to preserve or enhance wildlife, if any.

None proposed.

e. List any invasive animal species known to be on or near the site.

None known.

6. Energy and natural resources

[Find help answering energy and natural resource questions](#)⁹

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The proposed backup generator to be installed would be fueled by diesel.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.

Please see the generator specifications included with this submittal.

7. Environmental health

[Health Find help with answering environmental health questions](#)¹⁰

⁹ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-6-Energy-natural-resou>

¹⁰ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-7-Environmental-health>

- a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.**

No environmental health hazards would occur from the installation of the new emergency generator. The emission levels have been calculated and have been proven to be below legal limits. Fuel spill hazards are controlled via secondary containment as required by state code.

1. **Describe any known or possible contamination at the site from present or past uses.**

None known.

2. **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

The proposed backup generator is fueled by diesel.

3. **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

Diesel fuel would be used to fuel the proposed generator.

4. **Describe special emergency services that might be required.**

None known.

5. **Proposed measures to reduce or control environmental health hazards, if any.**

Please see the measures taken within the generator submittal and Environ Reports, which are included within this submittal. The proposed project would comply with applicable city, state, and federal requirements relative to environmental health regards. Proper spill containment structures and clean up materials would be included in the construction planset. If a spill occurs, Chelan PUD would notify the Department of Ecology as required.

b. Noise

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

Existing noise at the Rocky Reach Dam would not affect installation or operation of the proposed generator.

2. **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?**

During project construction, noise would be generated by construction equipment operating onsite. Construction practices would comply with applicable Chelan County noise ordinances.

3. Proposed measures to reduce or control noise impacts, if any:

There are measures included within the generator to reduce the noise and ensure the noise remains under the legal decibels.

8. Land and shoreline use

[Find help answering land and shoreline use questions](#)¹¹

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The current use of the site is the operation of the Rocky Reach Dam. Installation of the proposed generator would not have any effect on adjacent land uses.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses because of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No.

1. Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?

No.

c. Describe any structures on the site.

The Rocky Reach Dam.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

Rural Public

f. What is the current comprehensive plan designation of the site?

Rural Public

g. If applicable, what is the current shoreline master program designation of the site?

Urban

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

No.

¹¹ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-8-Land-shoreline-use>

- i. **Approximately how many people would reside or work in the completed project?**

Approximately 50-100 people are currently working at Rocky Reach Dam.

- j. **Approximately how many people would the completed project displace?**

None.

- k. **Proposed measures to avoid or reduce displacement impacts, if any.**

None proposed.

- l. **Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.**

The proposed backup generator is an allowed use in the zoning designation of the property.

- m. **Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:**

None proposed.

9. Housing

[Find help answering housing questions](#)¹²

- a. **Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

No housing units would be provided.

- b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

No housing units would be eliminated.

- c. **Proposed measures to reduce or control housing impacts, if any:**

None are proposed.

10. Aesthetics

[Find help answering aesthetics questions](#)¹³

- a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

No structures are proposed.

- b. **What views in the immediate vicinity would be altered or obstructed?**

No views would be altered or obstructed.

¹² <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-9-Housing>

¹³ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-10-Aesthetics>

- c. **Proposed measures to reduce or control aesthetic impacts, if any:**

None proposed.

11. Light and glare

[Find help answering light and glare questions](#)¹⁴

- a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**

The backup generator does not produce any source of light or glare.

- b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

No.

- c. **What existing off-site sources of light or glare may affect your proposal?**

None known.

- d. **Proposed measures to reduce or control light and glare impacts, if any:**

None proposed.

12. Recreation

[Find help answering recreation questions](#)

- a. **What designated and informal recreational opportunities are in the immediate vicinity?**

The Rocky Reach Discovery Center.

- b. **Would the proposed project displace any existing recreational uses? If so, describe.**

No recreational uses would be displaced from the installation of the proposed generator.

- c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

None proposed.

13. Historic and cultural preservation

[Find help answering historic and cultural preservation questions](#)¹⁵

- a. **Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.**

The Rocky Reach Dam was built between 1956 and 1961.

¹⁴ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-11-Light-glare>

¹⁵ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-13-Historic-cultural-p>

- b. **Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

No studies were performed for the proposed project since the proposed backup generator would be installed within the existing Rocky Reach Dam footprint and would not result in any ground disturbance.

- c. **Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.**

The WISAARD database was reviewed.

- d. **Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

None are proposed.

14. Transportation

[Find help with answering transportation questions](#)¹⁶

- a. **Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

The subject property is accessed off of Hwy. 97 just outside of the Wenatchee City Limits. The Rocky Reach Dam is owned and operated by Chelan County PUD.

- b. **Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

Yes, the subject property is served by Link Transit. The closest stop is located south of Rocky Reach Dam at the Stemilt Retail Store in Wenatchee, approximately 3 miles away.

- c. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

No improvements to existing transportation facilities are proposed.

- d. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

No.

¹⁶ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-14-Transportation>

- e. **How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

The proposed project would not generate regular vehicular trips.

- f. **Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

No.

- g. **Proposed measures to reduce or control transportation impacts, if any:**

None are proposed.

15. Public services

[Find help answering public service questions¹⁷](#)

- a. **Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.**

The proposed generator would not result in the need for increased public services.

- b. **Proposed measures to reduce or control direct impacts on public services, if any.**

None are proposed.

16. Utilities

[Find help answering utilities questions¹⁸](#)

- a. **Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:**

- b. **Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

The new emergency generator would be hooked up to the existing power grid at Rocky Reach Dam that is owned and operated by Chelan County PUD.

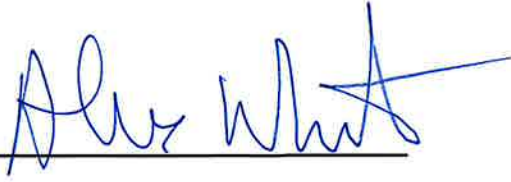
¹⁷ <https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-15-public-services>

¹⁸ <https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-16-utilities>

C. Signature

[Find help about who should sign](https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-C-Signature)¹⁹

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

X 

Type name of signee: Alex White

Position and agency/organization: Environmental Permit Coordinator / Chelan County PUD

Date submitted: April 1, 2026

¹⁹ <https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-C-Signature>



PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY

P.O. Box 1231, Wenatchee, WA 98807-1231 • 203 Olds Station Rd., Wenatchee, WA 98801

(509) 663-8121 • Toll free 1-888-663-8121 • www.chelanpud.org

STATE ENVIRONMENTAL POLICY ACT

Determination of NonSignificance

April 1, 2026

Lead agency: Chelan County PUD

Agency Contact: Alex White / alex.white@chelanpud.org / 509-661-8148

Description of proposal:

Chelan PUD is proposing to replace the existing Cummins 300 kW diesel fired emergency generator at the Rocky Reach Dam facility with a new Caterpillar C18 In-line, 4-cycle diesel 750 kW generator. This project includes the removal of the existing generator and the installation of the new diesel generator and all necessary modifications to supplement black start capabilities at the Chelan County PUD Rocky Reach facility.

Location of proposal:

The proposed project takes place at the Rocky Reach Dam located off of Hwy. 97 approximately three miles north of Wenatchee. The Parcel # of the subject property is 24-20-35-330-150.

Chelan PUD has determined that this proposal will not have a probable significant adverse impact on the environment. This determination is based on the following findings and conclusions: This project will not adversely impact fish, wildlife, water quality or cultural resources, and will employ best management practices as specified in the Temporary Erosion and Sediment Control (TESC) Plan being prepared for the project. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). We have prepared an Environmental Checklist after analysis of site conditions. This information is available to the public upon request.

This DNS is issued under WAC 197-11-340(2). The lead agency will not act on this proposal for at least 14 days after the above date. Please submit all comments to the Agency Contact above prior to 5:00 pm on April 15, 2026.

SEPA Responsible Official: Alex White

Signature

Date

4/1/2026

APPENDIX G

Emission Factor Reference Documents

PERFORMANCE DATA [LS3489]

SEPTEMBER 04, 2025

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

Perf No: EM3842

Change Level: 03

General

Heat Rejection

Emissions

Regulatory

Altitude Derate

Cross Reference

Perf Param Ref

View PDF

SALES MODEL:	C18	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
MACHINE SALES MODEL:		HERTZ:	60
ENGINE POWER (BHP):	1,112	FAN POWER (HP):	42.2
GEN POWER WITH FAN (EKW):	750.0	ADDITIONAL PARASITICS (HP):	3.4
COMPRESSION RATIO:	14	ASPIRATION:	TA
RATING LEVEL:	STANDBY	AFTERCOOLER TYPE:	ATAAC
PUMP QUANTITY:	1	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
FUEL TYPE:	DIESEL	INLET MANIFOLD AIR TEMP (F):	120
MANIFOLD TYPE:	DRY	JACKET WATER TEMP (F):	192.2
GOVERNOR TYPE:	ELEC	TURBO CONFIGURATION:	PARALLEL
CAMSHAFT TYPE:	STANDARD	TURBO QUANTITY:	2
IGNITION TYPE:	CI	TURBOCHARGER MODEL:	GTD5008 0.75 A/R
INJECTOR TYPE:	EUI	CERTIFICATION YEAR:	2018
REF EXH STACK DIAMETER (IN):	6	PISTON SPD @ RATED ENG SPD (FT/MIN):	2,161.4
MAX OPERATING ALTITUDE (FT):	3,553		

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)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR	LB/EKW-HR	LB/EKW-HR
750.0	100	1,112	442	0.342	0.338	53.6	53.1	0.507	0.502
675.0	90	1,002	399	0.345	0.342	48.8	48.3	0.513	0.508
600.0	80	894	356	0.355	0.352	44.8	44.3	0.529	0.524
562.5	75	840	334	0.362	0.358	42.8	42.4	0.540	0.535
525.0	70	787	313	0.357	0.354	39.6	39.2	0.535	0.530
450.0	60	680	271	0.347	0.344	33.3	33.0	0.524	0.519
375.0	50	575	229	0.350	0.347	28.4	28.1	0.537	0.532
300.0	40	471	187	0.356	0.352	23.6	23.4	0.559	0.553
225.0	30	367	146	0.365	0.362	18.9	18.7	0.596	0.591
187.5	25	315	125	0.373	0.369	16.6	16.4	0.627	0.621
150.0	20	262	104	0.384	0.381	14.2	14.1	0.672	0.666
75.0	10	155	62	0.436	0.432	9.5	9.5	0.903	0.894

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
750.0	100	1,112	99.6	120.6	1,297.4	91.1	847.3	106	491.8
675.0	90	1,002	94.8	116.3	1,237.8	85.6	808.8	101	471.6
600.0	80	894	90.6	110.2	1,190.8	81.2	779.6	97	456.4
562.5	75	840	88.9	106.0	1,168.7	79.4	765.3	95	449.8

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
525.0	70	787	83.3	102.6	1,123.3	73.0	732.9	89	427.8
450.0	60	680	70.0	97.1	1,044.2	59.2	681.5	75	378.6
375.0	50	575	58.7	92.6	995.6	48.8	659.1	63	343.0
300.0	40	471	46.1	89.2	946.5	38.8	636.5	50	296.8
225.0	30	367	33.0	85.9	891.7	28.9	613.3	36	248.4
187.5	25	315	26.7	84.2	861.7	23.9	601.4	30	224.2
150.0	20	262	20.9	82.5	823.8	19.2	583.1	23	199.8
75.0	10	155	10.7	79.1	696.6	12.2	500.0	13	150.3

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
750.0	100	1,112	2,375.0	6,028.4	10,393.9	10,773.8	2,267.8	2,078.6
675.0	90	1,002	2,311.8	5,661.5	10,079.7	10,425.9	2,194.5	2,019.7
600.0	80	894	2,255.1	5,366.3	9,808.8	10,125.6	2,129.1	1,967.2
562.5	75	840	2,232.7	5,242.8	9,695.0	9,998.8	2,104.4	1,948.0
525.0	70	787	2,128.6	4,886.8	9,201.8	9,479.4	2,014.8	1,868.9
450.0	60	680	1,924.5	4,154.8	8,250.4	8,484.5	1,790.1	1,665.9
375.0	50	575	1,724.0	3,614.1	7,338.5	7,539.3	1,588.3	1,481.3
300.0	40	471	1,496.1	3,059.1	6,324.6	6,492.2	1,372.1	1,282.4
225.0	30	367	1,252.4	2,494.4	5,258.7	5,392.8	1,143.0	1,070.6
187.5	25	315	1,129.6	2,211.4	4,728.5	4,845.9	1,024.7	960.8
150.0	20	262	1,009.9	1,930.2	4,215.5	4,316.3	910.1	854.6
75.0	10	155	782.1	1,374.8	3,253.5	3,321.2	704.3	665.3

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
750.0	100	1,112	12,818	8,047	40,603	22,636	6,204	15,452	47,163	116,484	124,084
675.0	90	1,002	11,743	6,958	37,522	20,109	5,654	14,340	42,509	106,146	113,072
600.0	80	894	10,952	6,200	35,048	18,214	5,186	13,597	37,916	97,360	103,713
562.5	75	840	10,640	5,836	33,785	17,352	4,962	13,346	35,638	93,166	99,245
525.0	70	787	9,859	5,705	30,827	15,116	4,587	11,983	33,363	86,117	91,736
450.0	60	680	8,318	5,623	24,979	11,650	3,854	9,300	28,853	72,352	77,073
375.0	50	575	7,503	5,062	21,470	9,629	3,289	7,357	24,380	61,743	65,772
300.0	40	471	6,805	4,763	17,924	7,664	2,736	5,257	19,977	51,373	54,726
225.0	30	367	6,315	4,137	14,360	5,834	2,190	3,423	15,572	41,123	43,806
187.5	25	315	6,146	3,592	12,622	4,998	1,918	2,650	13,357	36,017	38,367
150.0	20	262	5,811	3,166	10,852	4,120	1,647	1,979	11,122	30,914	32,931
75.0	10	155	4,464	2,714	7,429	2,021	1,106	928	6,579	20,759	22,114

Emissions Data [Top](#)

Units Filter

All Units

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		EKW	750.0	562.5	375.0	187.5	75.0
ENGINE POWER		BHP	1,112	840	575	315	155
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	5,965	3,126	2,054	1,344	778
TOTAL CO		G/HR	243	232	76	312	1,148
TOTAL HC		G/HR	66	67	47	55	458
TOTAL CO2		KG/HR	552	441	292	172	96
PART MATTER		G/HR	33.7	34.4	21.3	25.5	73.8
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,468.0	1,615.7	1,594.0	1,789.0	1,769.3
TOTAL CO	(CORR 5% O2)	MG/NM3	100.1	120.0	57.8	462.4	3,203.4
TOTAL HC	(CORR 5% O2)	MG/NM3	23.5	29.8	32.1	65.0	1,156.1
PART MATTER	(CORR 5% O2)	MG/NM3	11.7	15.2	14.2	30.4	185.1
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	915.8	599.5	591.5	663.9	656.5
TOTAL CO	(CORR 15% O2)	MG/NM3	37.1	44.5	21.4	171.6	1,188.7
TOTAL HC	(CORR 15% O2)	MG/NM3	8.7	11.1	11.9	24.1	429.0
PART MATTER	(CORR 15% O2)	MG/NM3	4.3	5.7	5.3	11.3	68.7
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,202	787	776	871	862
TOTAL CO	(CORR 5% O2)	PPM	80	96	46	370	2,563
TOTAL HC	(CORR 5% O2)	PPM	44	56	60	121	2,158
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	446	292	288	323	320
TOTAL CO	(CORR 15% O2)	PPM	30	36	17	137	951
TOTAL HC	(CORR 15% O2)	PPM	16	21	22	45	801
TOTAL NOX (AS NO2)		G/HP-HR	5.42	3.75	3.59	4.27	5.02
TOTAL CO		G/HP-HR	0.22	0.28	0.13	0.99	7.41
TOTAL HC		G/HP-HR	0.06	0.08	0.08	0.17	2.96
PART MATTER		G/HP-HR	0.03	0.04	0.04	0.08	0.48
TOTAL NOX (AS NO2)		G/KW-HR	7.26	5.02	4.81	5.73	6.73
TOTAL CO		G/KW-HR	0.30	0.37	0.18	1.33	9.93
TOTAL HC		G/KW-HR	0.08	0.11	0.11	0.23	3.96
PART MATTER		G/KW-HR	0.04	0.06	0.05	0.11	0.64
TOTAL NOX (AS NO2)		LB/HR	13.15	6.89	4.53	2.96	1.72
TOTAL CO		LB/HR	0.54	0.51	0.17	0.69	2.53
TOTAL HC		LB/HR	0.14	0.15	0.10	0.12	1.01
TOTAL CO2		LB/HR	1,217	971	644	380	211
PART MATTER		LB/HR	0.07	0.08	0.05	0.06	0.16
OXYGEN IN EXH		%	9.8	11.5	12.7	13.5	14.9
DRY SMOKE OPACITY		%	0.5	0.8	0.5	1.0	0.5
BOSCH SMOKE NUMBER			0.71	0.79	0.71	0.86	0.71

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		EKW	750.0	562.5	375.0	187.5	75.0
ENGINE POWER		BHP	1,112	840	575	315	155
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	6,442	3,376	2,219	1,451	840
TOTAL CO		G/HR	454	434	142	583	2,147
TOTAL HC		G/HR	124	126	89	103	866
PART MATTER		G/HR	65.6	67.1	41.6	49.7	144.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,665.4	1,745.0	1,721.5	1,932.2	1,910.9
TOTAL CO	(CORR 5% O2)	MG/NM3	187.1	224.5	108.1	864.7	5,990.4
TOTAL HC	(CORR 5% O2)	MG/NM3	44.4	56.3	60.6	122.9	2,185.0
PART MATTER	(CORR 5% O2)	MG/NM3	22.8	29.7	27.7	59.3	361.0
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	989.1	647.5	638.8	717.0	709.1
TOTAL CO	(CORR 15% O2)	MG/NM3	69.4	83.3	40.1	320.9	2,222.8
TOTAL HC	(CORR 15% O2)	MG/NM3	16.5	20.9	22.5	45.6	810.8
PART MATTER	(CORR 15% O2)	MG/NM3	8.4	11.0	10.3	22.0	134.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,298	850	839	941	931
TOTAL CO	(CORR 5% O2)	PPM	150	180	86	692	4,792
TOTAL HC	(CORR 5% O2)	PPM	83	105	113	229	4,079
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	482	315	311	349	345
TOTAL CO	(CORR 15% O2)	PPM	56	67	32	257	1,778
TOTAL HC	(CORR 15% O2)	PPM	31	39	42	85	1,513
TOTAL NOX (AS NO2)		G/HP-HR	5.85	4.05	3.88	4.62	5.42
TOTAL CO		G/HP-HR	0.41	0.52	0.25	1.85	13.85
TOTAL HC		G/HP-HR	0.11	0.15	0.16	0.33	5.59
PART MATTER		G/HP-HR	0.06	0.08	0.07	0.16	0.93
TOTAL NOX (AS NO2)		G/KW-HR	7.85	5.43	5.20	6.19	7.27
TOTAL CO		G/KW-HR	0.55	0.70	0.33	2.49	18.57
TOTAL HC		G/KW-HR	0.15	0.20	0.21	0.44	7.49
PART MATTER		G/KW-HR	0.08	0.11	0.10	0.21	1.25
TOTAL NOX (AS NO2)		LB/HR	14.20	7.44	4.89	3.20	1.85
TOTAL CO		LB/HR	1.00	0.96	0.31	1.28	4.73
TOTAL HC		LB/HR	0.27	0.28	0.20	0.23	1.91
PART MATTER		LB/HR	0.14	0.15	0.09	0.11	0.32

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STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)											
AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)											
0	1,112	1,112	1,112	1,111	1,106	1,101	1,096	1,089	1,054	987	1,112
1,000	1,112	1,112	1,112	1,107	1,102	1,097	1,092	1,066	1,006	957	1,110
2,000	1,112	1,111	1,106	1,101	1,096	1,091	1,063	1,002	956	916	1,105
3,000	1,110	1,105	1,100	1,095	1,088	1,058	996	954	915	854	1,101
4,000	1,103	1,097	1,082	1,069	1,051	990	950	912	852	793	1,090
5,000	1,067	1,045	1,023	1,002	981	944	907	845	792	739	1,043
6,000	1,039	1,013	993	975	955	918	862	805	776	696	1,020
7,000	1,020	1,000	984	969	943	900	835	793	757	680	1,013
8,000	999	982	967	954	923	867	808	764	723	670	999
9,000	973	958	944	932	898	826	769	720	703	665	979
10,000	944	930	917	906	851	795	748	720	698	670	956
11,000	912	898	886	875	817	772	736	710	685	654	928
12,000	879	867	856	845	791	753	722	690	657	621	899
13,000	843	832	822	811	772	733	694	656	618	590	864
14,000	800	791	781	772	730	688	648	610	587	567	825
15,000	754	744	733	714	672	635	602	583	564	544	780

Cross Reference [Top](#)

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4581998	PP7270	5365365	GS668	-	LTH00001	
4582018	PP7585	5407425	EE563	-	LT400001	
4582018	PP7585	5407426	EE563	-	LT400001	
4581998	PP7270	5411973	GS668	-	LTH00001	

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Parameters Reference: DM9600 - 15

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% Specific fuel consumption (C7-C18) +/- 4% 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. On 3500 and C175 engines, at speeds below Peak Torque 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.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION: Wet - Total exhaust flow or concentration of total exhaust flow Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

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 : 03/12/24

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3.3 Gasoline And Diesel Industrial Engines

Disclaimer: Emission factors in AP-42 are neither EPA-recommended emission limits (e.g., best available control technology or BACT, or lowest achievable emission rate or LAER) nor standards (e.g., National Emission Standard for Hazardous Air Pollutants or NESHAP, or New Source Performance Standards or NSPS). Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is **NOT** recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources are expected to have emission rates greater than the emission factor, and the other half are expected to have emission rates less than the emission factor. As such, EPA does not recommend using emission factors as limits or standards. This could cause, for example, a permit limit using an AP-42 emission factor resulting in approximately half of the sources being in noncompliance. We recommend source testing be done for the best possible emission values. For more information on the use of emission factors, please refer to the [AP-42 Introduction](#).

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, forklifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.¹

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the atmosphere from the exhaust. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels.

The primary pollutants from internal combustion engines are oxides of nitrogen (NO_x), total organic compounds (TOC), carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides (SO_x) also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide (SO_2), are directly related to the sulfur content of the fuel.²

3.3.3.1 Nitrogen Oxides –

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal NO_x which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most thermal NO_x is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some NO_x , called prompt NO_x , is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel NO_x , stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically-bound fuel N_2 and essentially all NO_x formed is thermal NO_x .

3.3.3.2 Total Organic Compounds –

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.²

3.3.3.3 Carbon Monoxide –

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO₂ cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.²⁻³

3.3.3.4 Smoke and Particulate Matter –

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient.²

3.3.3.5 Sulfur Oxides –

Sulfur oxides emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO₂. The oxidation of SO₂ gives sulfur trioxide (SO₃), which reacts with water to give sulfuric acid (H₂SO₄), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.²⁻³

3.3.4 Control Technologies

Control measures to date are primarily directed at limiting NO_x and CO emissions since they are the primary pollutants from these engines. From a NO_x control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of O₂. The most common NO_x control technique for diesel and dual-fuel engines focuses on modifying the combustion process. However, selective

catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Controls for CO have been partly adapted from mobile sources.⁴

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio adjustments, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering NO_x formation. ITR reduces NO_x from all diesel engines; however, the effectiveness is specific to each engine model. The amount of NO_x reduction with ITR diminishes with increasing levels of retard.⁴

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing NO_x emissions.⁴

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO_x to decrease because of lower oxygen and lower temperatures. Derating involves restricting the engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures, thereby lowering NO_x formation rates.⁴

SCR is an add-on NO_x control placed in the exhaust stream following the engine and involves injecting ammonia (NH₃) into the flue gas. The NH₃ reacts with NO_x in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO_x concentration which can create problems with the effectiveness of the SCR system.⁴

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO_x, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O₂ levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.⁴

The most accurate method for calculating such emissions is on the basis of "brake-specific" emission factors (pounds per horsepower-hour [lb/hp-hr]). Emissions are the product of the brake-specific emission factor, the usage in hours, the rated power available, and the load factor (the power actually used divided by the power available). However, for emission inventory purposes, it is often easier to assess this activity on the basis of fuel used.

Once reasonable usage and duty cycles for this category were ascertained, emission values were aggregated to arrive at the factors for criteria and organic pollutants presented. Factors in Table 3.3-1 are in pounds per million British thermal unit (lb/MMBtu). Emission data for a specific design type were weighted according to estimated material share for industrial engines. The emission factors in these tables, because of their aggregate nature, are most appropriately applied to a population of industrial

engines rather than to an individual power plant. Table 3.3-2 shows unweighted speciated organic compound and air toxic emission factors based upon only 2 engines. Their inclusion in this section is intended for rough order-of-magnitude estimates only.

Table 3.3-3 summarizes whether the various diesel emission reduction technologies (some of which may be applicable to gasoline engines) will generally increase or decrease the selected parameter. These technologies are categorized into fuel modifications, engine modifications, and exhaust after-treatments. Current data are insufficient to quantify the results of the modifications. Table 3.3-3 provides general information on the trends of changes on selected parameters.

3.3.5 Source Classification Codes

- 20100102 - Internal Combustion Engines; Electric Generation; Distillate Oil (Diesel); Reciprocating
- 20100105 - Internal Combustion Engines; Electric Generation; Distillate Oil (Diesel); Reciprocating: Crankcase Blowby
- 20100106 - Internal Combustion Engines; Electric Generation; Distillate Oil (Diesel); Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
- 20100107 - Internal Combustion Engines; Electric Generation; Distillate Oil (Diesel); Reciprocating: Exhaust
- 20200102 - Internal Combustion Engines; Industrial; Distillate Oil (Diesel); Reciprocating
- 20200104 - Internal Combustion Engines; Industrial; Distillate Oil (Diesel); Reciprocating: Cogeneration
- 20200105 - Internal Combustion Engines; Industrial; Distillate Oil (Diesel); Reciprocating: Crankcase Blowby
- 20200106 - Internal Combustion Engines; Industrial; Distillate Oil (Diesel); Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
- 20200107 - Internal Combustion Engines; Industrial; Distillate Oil (Diesel); Reciprocating: Exhaust
- 20201702 - Internal Combustion Engines; Industrial; Gasoline; Reciprocating Engine
- 20201705 - Internal Combustion Engines; Industrial; Gasoline; Reciprocating: Crankcase Blowby
- 20201706 - Internal Combustion Engines; Industrial; Gasoline; Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
- 20201707 - Internal Combustion Engines; Industrial; Gasoline; Reciprocating: Exhaust
- 20300101 - Internal Combustion Engines; Commercial/Institutional; Distillate Oil (Diesel); Reciprocating
- 20300105 - Internal Combustion Engines; Commercial/Institutional; Distillate Oil (Diesel); Reciprocating: Crankcase Blowby
- 20300106 - Internal Combustion Engines; Commercial/Institutional; Distillate Oil (Diesel); Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
- 20300107 - Internal Combustion Engines; Commercial/Institutional; Distillate Oil (Diesel); Reciprocating: Exhaust
- 20300301 - Internal Combustion Engines; Commercial/Institutional; Gasoline; Reciprocating
- 20300305 - Internal Combustion Engines; Commercial/Institutional; Gasoline; Reciprocating: Crankcase Blowby
- 20300306 - Internal Combustion Engines; Commercial/Institutional; Gasoline; Reciprocating: Evaporative Losses (Fuel Storage and Delivery System)
- 20300307 - Internal Combustion Engines; Commercial/Institutional; Gasoline; Reciprocating: Exhaust
- 20300401 - Internal Combustion Engines; Commercial/Institutional; Diesel; Large Bore Engine
- 20400401 - Internal Combustion Engines; Engine Testing; Reciprocating Engine; Gasoline
- 20400403 - Internal Combustion Engines; Engine Testing; Reciprocating Engine; Distillate Oil

3.3.6 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below.

February 1996 (Supplement A)

- No changes

October 1996 (Supplement B)

- Text was revised concerning emissions and controls.
- The CO₂ emission factor was adjusted to reflect 98.5 percent conversion efficiency.

April 2025

- Standard AP-42 disclaimer was added on the use of AP-42 emission factors.
- Added Source Classification Codes
- Benzo(g,h,i)perylene pollutant name corrected to Benzo(g,h,i)perylene in Table 3.3-2.

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE
AND DIESEL INDUSTRIAL ENGINES^a

Pollutant	Gasoline Fuel (SCC 20200301, 20300301) Emission Factor (lb/hp-hr) (power output)	Gasoline Fuel (SCC 20200301, 20300301) Emission Factor (lb/MMBtu) (fuel input)	Diesel Fuel (SCC 20200102, 20300101) Emission Factor (lb/hp- hr) (power output)	Diesel Fuel (SCC 20200102, 20300101) Emission Factor (lb/MMBtu) (fuel input)	Emission Factor Rating
NO _x	0.011	1.63	0.031	4.41	D
CO	6.96 E-03 ^d	0.99 ^d	6.68 E-03	0.95	D
SO _x	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10 ^b	7.21 E-04	0.10	2.20 E-03	0.31	D
CO ₂ ^c	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC - Exhaust	0.015	2.10	2.47 E-03	0.35	D
TOC - Evaporative	6.61 E-04	0.09	0.00	0.00	E
TOC - Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
TOC - Refueling	1.08 E-03	0.15	0.00	0.00	E

^a References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

^b PM-10 = particulate matter less than or equal to 10 µm aerodynamic diameter. All particulate is assumed to be # 1 µm in size.

^c Assumes 99% conversion of carbon in fuel to CO₂ with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

^d Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009.

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES^a

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene ^b	9.33 E-04
Toluene ^b	4.09 E-04
Xylenes ^b	2.85 E-04
Propylene ^d	2.58 E-03
1,3-Butadiene ^{b,c}	<3.91 E-05
Formaldehyde ^b	1.18 E-03
Acetaldehyde ^b	7.67 E-04
Acrolein ^b	<9.25 E-05
Naphthalene ^b	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,i)perylene	<4.89 E-07
TOTAL PAH	1.68E-04

^a Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.

^b Hazardous air pollutant listed in the *Clean Air Act*.

^c Based on data from 1 engine.

^d The footnote indicating that Propylene is a CAA HAP compound was deleted on 10/27/2006. This is an editorial correction.

Table 3.3-3. EFFECT OF VARIOUS EMISSION CONTROL TECHNOLOGIES
ON DIESEL ENGINES^a

Technology	Affected Parameter Increase	Affected Parameter Decrease
Fuel modifications - Sulfur content increase	PM, wear	
Fuel modifications - Aromatic content increase	PM, NO _x	
Fuel modifications - Cetane number		PM, NO _x
Fuel modifications - 10% and 90% boiling point		PM
Fuel modifications - Fuel additives		PM, NO _x
Fuel modifications - Water/Fuel emulsions		NO _x
Engine modifications - Injection timing retard	PM, BSFC	NO _x , power
Engine modifications - Fuel injection pressure	PM, NO _x	
Engine modifications - Injection rate control		NO _x , PM
Engine modifications - Rapid spill nozzles		PM
Engine modifications - Electronic timing & metering		NO _x , PM
Engine modifications - Injector nozzle geometry		PM
Engine modifications - Combustion chamber modifications		NO _x , PM
Engine modifications - Turbocharging	PM, power	NO _x
Engine modifications - Charge cooling		NO _x
Engine modifications - Exhaust gas recirculation	PM, power, wear	NO _x
Engine modifications - Oil consumption control		PM, wear
Exhaust after-treatment - Particulate traps		PM
Exhaust after-treatment - Selective catalytic reduction		NO _x
Exhaust after-treatment - Oxidation catalysts		TOC, CO, PM

^a Reference 8. PM = particulate matter. BSFC = brake-specific fuel consumption.

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This content is from the eCFR and is authoritative but unofficial.

Title 40 —Protection of Environment

Chapter I —Environmental Protection Agency

Subchapter C —Air Programs

Part 98 —Mandatory Greenhouse Gas Reporting

Subpart C —General Stationary Fuel Combustion Sources

Authority: 42 U.S.C. 7401-7671q.

Source: 74 FR 56374, Oct. 30, 2009, unless otherwise noted.

Editorial Note: At 90 FR 21227, May 19, 2025, as required by the Congressional Review Act and Public Law 119-2, the Environmental Protection Agency removed the amendments to §§ 98.3 and 98.4 made effective on Jan. 17, 2025, at 89 FR 91163, Nov. 18, 2024. As of May 19, 2025, §§ 98.3 and 98.4 reverted to the Jan. 16, 2025 version.

Table C-1 to Subpart C of Part 98—Default CO₂ Emission Factors and High Heat Values for Various Types of Fuel

DEFAULT CO₂ EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

Fuel type	Default high heat value	Default CO ₂ emission factor
Coal and coke	mmBtu/short ton	kg CO ₂ /mmBtu
Anthracite	25.09	103.69

¹ The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

² Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

³ Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

⁴ Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default CO₂ emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

⁵ Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100) * HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

Fuel type	Default high heat value	Default CO ₂ emission factor
Bituminous	24.93	93.28
Subbituminous	17.25	97.17
Lignite	14.21	97.72
Coal Coke	24.80	113.67
Mixed (Commercial sector)	21.39	94.27
Mixed (Industrial coking)	26.28	93.90
Mixed (Industrial sector)	22.35	94.67
Mixed (Electric Power sector)	19.73	95.52
Natural gas	mmBtu/scf	kg CO ₂ /mmBtu
(Weighted U.S. Average)	1.026×10^{-3}	53.06
Petroleum products—liquid	mmBtu/gallon	kg CO ₂ /mmBtu
Distillate Fuel Oil No. 1	0.139	73.25
Distillate Fuel Oil No. 2	0.138	73.96
Distillate Fuel Oil No. 4	0.146	75.04
Residual Fuel Oil No. 5	0.140	72.93
Residual Fuel Oil No. 6	0.150	75.10
Used Oil	0.138	74.00
Kerosene	0.135	75.20
Liquefied petroleum gases (LPG) ¹	0.092	61.71
Propane ¹	0.091	62.87
Propylene ²	0.091	67.77
Ethane ¹	0.068	59.60
Ethanol	0.084	68.44
Ethylene ²	0.058	65.96

¹ The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

² Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

³ Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

⁴ Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default CO₂ emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

⁵ Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100) * HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

Fuel type	Default high heat value	Default CO ₂ emission factor
Isobutane ¹	0.099	64.94
Isobutylene ¹	0.103	68.86
Butane ¹	0.103	64.77
Butylene ¹	0.105	68.72
Naphtha (<401 deg F)	0.125	68.02
Natural Gasoline	0.110	66.88
Other Oil (>401 deg F)	0.139	76.22
Pentanes Plus	0.110	70.02
Petrochemical Feedstocks	0.125	71.02
Special Naphtha	0.125	72.34
Unfinished Oils	0.139	74.54
Heavy Gas Oils	0.148	74.92
Lubricants	0.144	74.27
Motor Gasoline	0.125	70.22
Aviation Gasoline	0.120	69.25
Kerosene-Type Jet Fuel	0.135	72.22
Asphalt and Road Oil	0.158	75.36
Crude Oil	0.138	74.54
Petroleum products—solid	mmBtu/short ton	kg CO ₂ /mmBtu.
Petroleum Coke	30.00	102.41.
Petroleum products—gaseous	mmBtu/scf	kg CO ₂ /mmBtu.
Propane Gas	2.516 × 10 ⁻³	61.46.
Other fuels—solid	mmBtu/short ton	kg CO ₂ /mmBtu
Municipal Solid Waste	9.95 ³	90.7
Tires	28.00	85.97

¹ The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

² Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

³ Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

⁴ Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default CO₂ emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

⁵ Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100) * HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

Fuel type	Default high heat value	Default CO ₂ emission factor
Plastics	38.00	75.00
Other fuels—gaseous	mmBtu/scf	kg CO ₂ /mmBtu
Blast Furnace Gas	0.092×10^{-3}	274.32
Coke Oven Gas	0.599×10^{-3}	46.85
Fuel Gas ⁴	1.388×10^{-3}	59.00
Biomass fuels—solid	mmBtu/short ton	kg CO ₂ /mmBtu
Wood and Wood Residuals (dry basis) ⁵	17.48	93.80
Agricultural Byproducts	8.25	118.17
Peat	8.00	111.84
Solid Byproducts	10.39	105.51
Biomass fuels—gaseous	mmBtu/scf	kg CO ₂ /mmBtu
Landfill Gas	0.485×10^{-3}	52.07
Other Biomass Gases	0.655×10^{-3}	52.07
Biomass Fuels—Liquid	mmBtu/gallon	kg CO ₂ /mmBtu
Ethanol	0.084	68.44
Biodiesel (100%)	0.128	73.84
Rendered Animal Fat	0.125	71.06
Vegetable Oil	0.120	81.55

¹ The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

² Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

³ Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

⁴ Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default CO₂ emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

⁵ Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100) * HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

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Title 40 —Protection of Environment

Chapter I —Environmental Protection Agency

Subchapter C —Air Programs

Part 98 —Mandatory Greenhouse Gas Reporting

Subpart C —General Stationary Fuel Combustion Sources

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Table C-2 to Subpart C of Part 98—Default CH₄ and N₂O Emission Factors for Various Types of Fuel

Fuel type	Default CH ₄ emission factor (kg CH ₄ /mmBtu)	Default N ₂ O emission factor (kg N ₂ O/mmBtu)
Coal and Coke (All fuel types in Table C-1)	1.1 × 10 ⁻⁰²	1.6 × 10 ⁻⁰³
Natural Gas ¹	1.0 × 10 ⁻⁰³	1.0 × 10 ⁻⁰⁴
Petroleum Products (All fuel types in Table C-1)	3.0 × 10 ⁻⁰³	6.0 × 10 ⁻⁰⁴
Fuel Gas	3.0 × 10 ⁻⁰³	6.0 × 10 ⁻⁰⁴
Other Fuels—Solid	3.2 × 10 ⁻⁰²	4.2 × 10 ⁻⁰³
Blast Furnace Gas	2.2 × 10 ⁻⁰⁵	1.0 × 10 ⁻⁰⁴
Coke Oven Gas	4.8 × 10 ⁻⁰⁴	1.0 × 10 ⁻⁰⁴
Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals)	3.2 × 10 ⁻⁰²	4.2 × 10 ⁻⁰³
Wood and wood residuals	7.2 × 10 ⁻⁰³	3.6 × 10 ⁻⁰³
Biomass Fuels—Gaseous (All fuel types in	3.2 × 10 ⁻⁰³	6.3 × 10 ⁻⁰⁴

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH₄/mmBtu.

¹ Reporters subject to subpart W of this part may only use the default CH₄ emission factor for natural gas-fired combustion units that are not reciprocating internal combustion engines or gas turbines. For natural gas-fired reciprocating internal combustion engines or gas turbines, at facilities subject to subpart W of this part, reporters must use a CH₄ emission factor determined in accordance with § 98.233(z)(4).

Fuel type	Default CH ₄ emission factor (kg CH ₄ /mmBtu)	Default N ₂ O emission factor (kg N ₂ O/mmBtu)
Table C-1) Biomass Fuels—Liquid (All fuel types in Table C-1)	1.1 × 10 ⁻⁰³	1.1 × 10 ⁻⁰⁴

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH₄/mmBtu.

¹ Reporters subject to subpart W of this part may only use the default CH₄ emission factor for natural gas-fired combustion units that are not reciprocating internal combustion engines or gas turbines. For natural gas-fired reciprocating internal combustion engines or gas turbines, at facilities subject to subpart W of this part, reporters must use a CH₄ emission factor determined in accordance with § 98.233(z)(4).

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