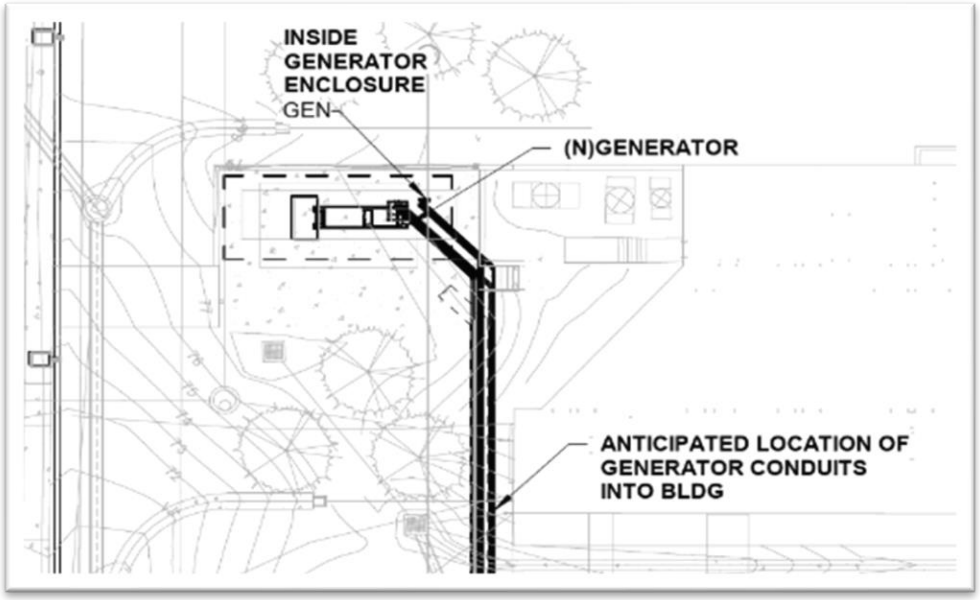
ITEM OPPORTUNITY SYNOPSIS

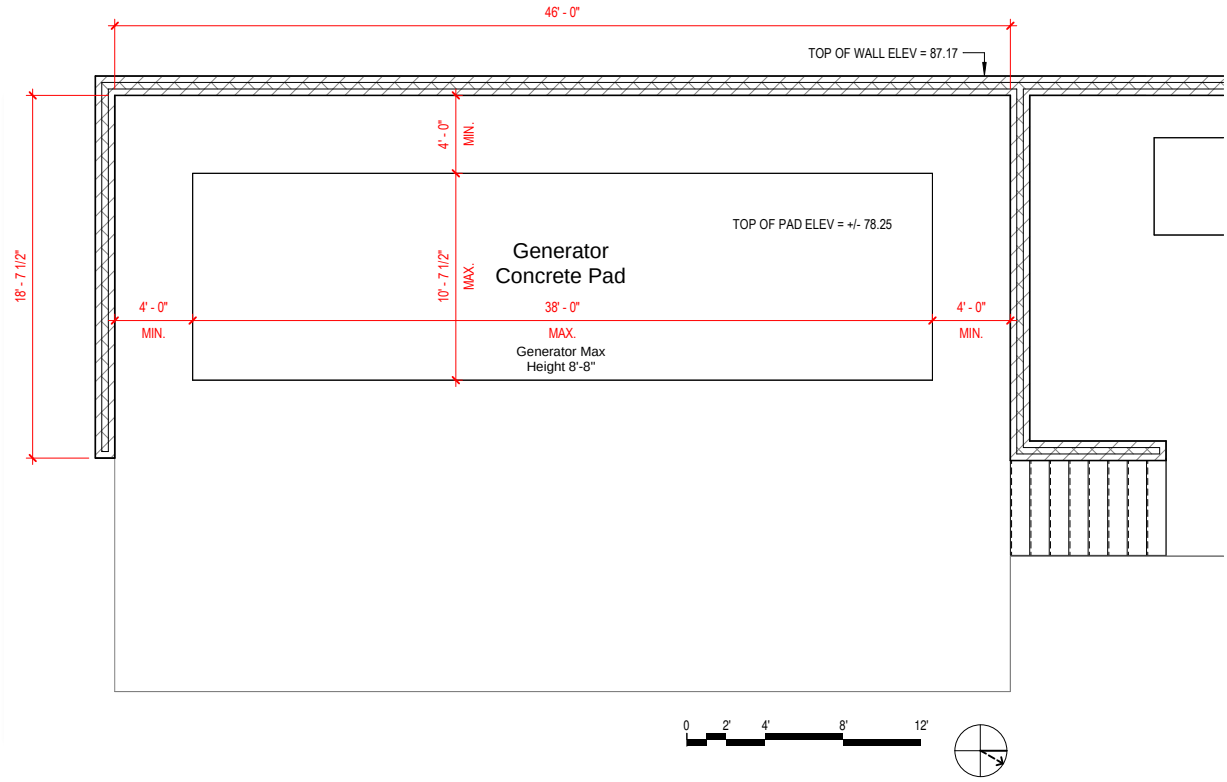
Scouting Number:	2024-065
Name of the item to be scouted:	Generator
State item to be used in:	Colorado
Describe the Item:	
Please describe the item application/the end use of the item.	For the construction of the new Energy and Minerals Research Facility (EMRF) for the U. S. Geological Survey (USGS) at the Colorado School of Mines (Mines), 1000 18th Street, Golden, Colorado 80401, provide a packaged engine generator. This project is federally funded by the President Joe Biden's Bipartisan Infrastructure Law (BIL). Therefore, the material used for construction is required to be compliant with the Build America, Buy America Act (BABAA). This NIST MEP Supplier Report seeks a BABAA compliant generator that meets or exceeds the basis of design. The basis of design is a Cummins Generator, Model #C1500D6E. The basis of design generator meets or exceeds the design requirements including the maximum delivery and placement schedule, and the maximum cost parameters enclosed. See also the requirements stated in the enclosed specifications, drawings, dimension and performance requirements, and other documents including warranty requirements. Packaged engine generator system and associated components and accessories include the following: 1. Engine and engine accessory equipment. 2. Alternator (generator). 3. Generator set control system. 4. Generator set enclosure.
Supplier Information:	
Type of Supplier Being Sought (select from the list below):	
Manufacturer	x
Contract Manufacturer	
Distributor	
Other (Please Specify)	
Reason for Scouting Submission (select from the list below)	
2nd Supplier	
Price	
Re-Shore	
Past supplier no longer available	
New Product Startup	
BABA	x
Other (Please Specify)	
Summary of Technical Specifications and Performance Requirements:	
Describe the manufacturing processes (elaborate to provide as much detail as possible)	Electronic and mechanical assembly.
Provide dimensions / size / tolerances / performance specifications of the item	See information provided.
List required materials needed to make the product, including materials of product components, if applicable	Various, see information provided.
Are there applicable certification requirements?	
Yes	x
No	
Please explain:	UL - See additional code and stardards in attached documents.
Are there any applicable regulations that apply to the production of this item?	
Yes	x
No	
Please explain:	The City of Golden Noise Regulations require the maximum generator noise at any time to be 62 dBA at a maximum dimension of 65-feet. The basis of design Cummins generator will provide an enclosure equal to this noise rating. Per local regulations, the generator is required to have emission controls equal to, U.S. EPA Tier Four exhaust emission levels. The basis of design Cummins generator will have this option provided.

Are there any other standards / requirements?	
Yes	x
No	
Please explain:	See the Cummins attached brochure, section "Codes and Standards" and specifications section 1.03 Reference Standards, section 1.06 Quality Assurance, and other applicable requirements.
Additional Comments:	
Additional technical comments:	See enclosed specification section and Cummins Generator information.
Volume and Pricing:	
Estimated Potential Business Volume (i.e. #units per day, month, year):	Limited to one.
Estimated Target Price/Unit Cost Information:	$788,000 including shipping, crane pick placement, start up services including commissioning and coordinating generator with Building Automation System, and required manufacturer's warranty. Costs also include providing approved submittal paperwork required in the specifications.
Delivery Requirements:	
When is it needed by? (Immediate, 30 days, 6 months, etc.)	No later than end of the day November 1, 2025 for the manufacturer, transportation, delivery and placement of the generator. If the schedule is the for the placement of the generator to be on any date prior to November 1, 2025, this placement date will need to be coordinated with the general contractor. No storage fees will be allowed for the time between the manufacturing date and the delivery and placement date.
Describe packaging requirements (i.e. individually/group packaging, etc.)	Crate and package generator for secure transportation, delivery, and placement.
Where will this item be shipped?	Shipping and placement will be to Golden, Colorado 80401.
Additional Comments:	
Is there other information you would like to include?	

EMRF Generator
NIST MEP Submittal
March 8, 2024

Site Plan Location Map:

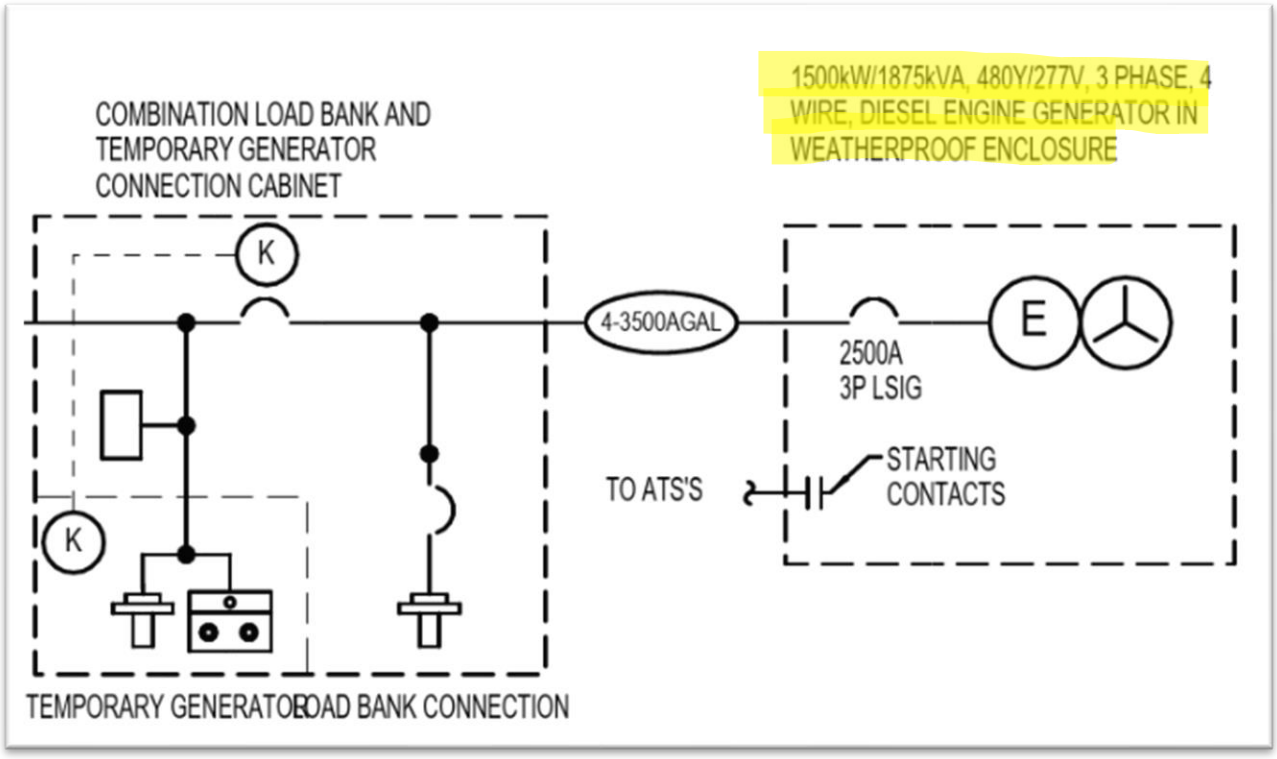




Enclosure Dimensions:

From the drawing above, the generator enclosure's dimensions are fixed. Provide a generator with the maximum length, width, and height indicated to sit on the concrete pad size indicated. The generator must be able to be serviced by the minimum side clearances indicated.

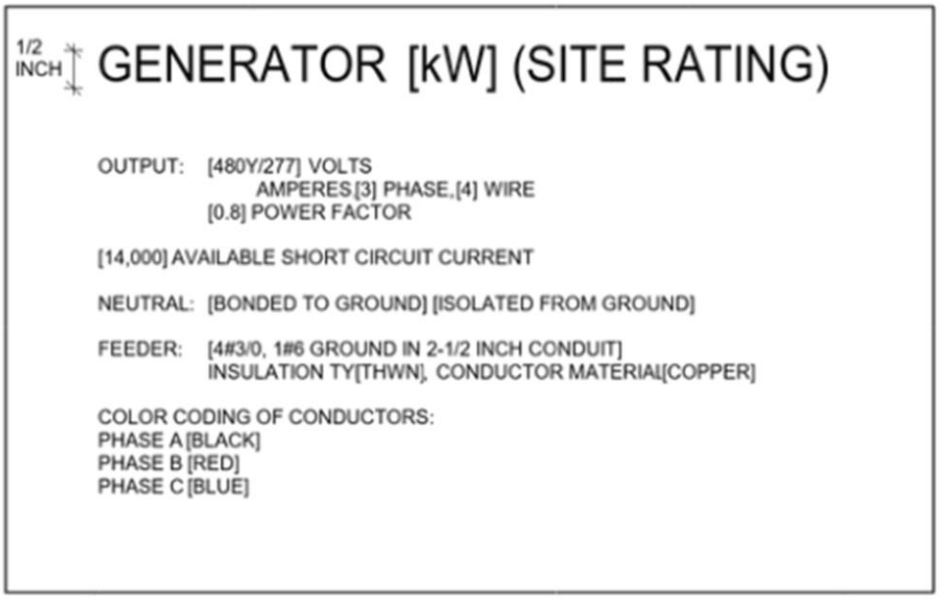
Generator performance requirements:



15. THE BUILDING WILL BE PROVIDED WITH AN EMERGENCY AND STANDBY DISTRIBUTION SYSTEM CONSISTING OF AN ENGINE GENERATOR AND GENERATOR POWER DISTRIBUTION BOARD WITH 5 SECTIONS FOR: EMERGENCY BRANCH, LEGALLY REQUIRED STAND-BY BRANCH, OPTIONAL STAND-BY BRANCH, FEEDER FROM THE GENERATOR, AND FEEDER FOR A PORTABLE GENERATOR. THE GENERATOR AND PORTABLE GENERATOR SOURCES WILL BE INTERLOCKED FOR COMPLIANCE WITH 2017 NEC ARTICLE 700.3(F). EACH BRANCH WILL BE PROVIDED WITH A DEDICATED AUTOMATIC TRANSFER SWITCH. THE NEW ENGINE GENERATOR IS ANTICIPATED TO BE A DIESEL UNIT WITH A WEATHERPROOF, SOUND ATTENUATING HOUSING, CRITICAL GRADE SILENCER, 80 DEGREE RISE ALTERNATOR, AND 12% SUB-TRANSIENT REACTANCE. THE DIESEL ENGINE GENERATOR SET WILL BE LOCATED EXTERIOR TO THE BUILDING WITHIN AN ARCHITECTURAL ENCLOSURE. THE GENERATOR FUEL TANK WILL BE SIZED TO PROVIDE BETWEEN 16 AND 24 HOURS RUN TIME AT FULL LOAD, BASED ON AVAILABLE STANDARD SIZE SKID MOUNTED FUEL TANKS. THE FUEL TANK SHALL BE DOUBLE WALL CONSTRUCTION MEETING THE REQUIREMENTS OF UL 142.

NOTES:

1. MINIMUM TEXT HEIGHT 1/8 INCH, UNLESS NOTED OTHERWISE.
2. WHITE LETTERS ON BLACK BACKGROUND FOR NORMAL POWER EQUIPMENT.
3. WHITE LETTERS ON RED BACKGROUND FOR EMERGENCY POWER EQUIPMENT.
4. WHITE LETTERS ON BLUE BACKGROUND FOR UPS POWER EQUIPMENT.

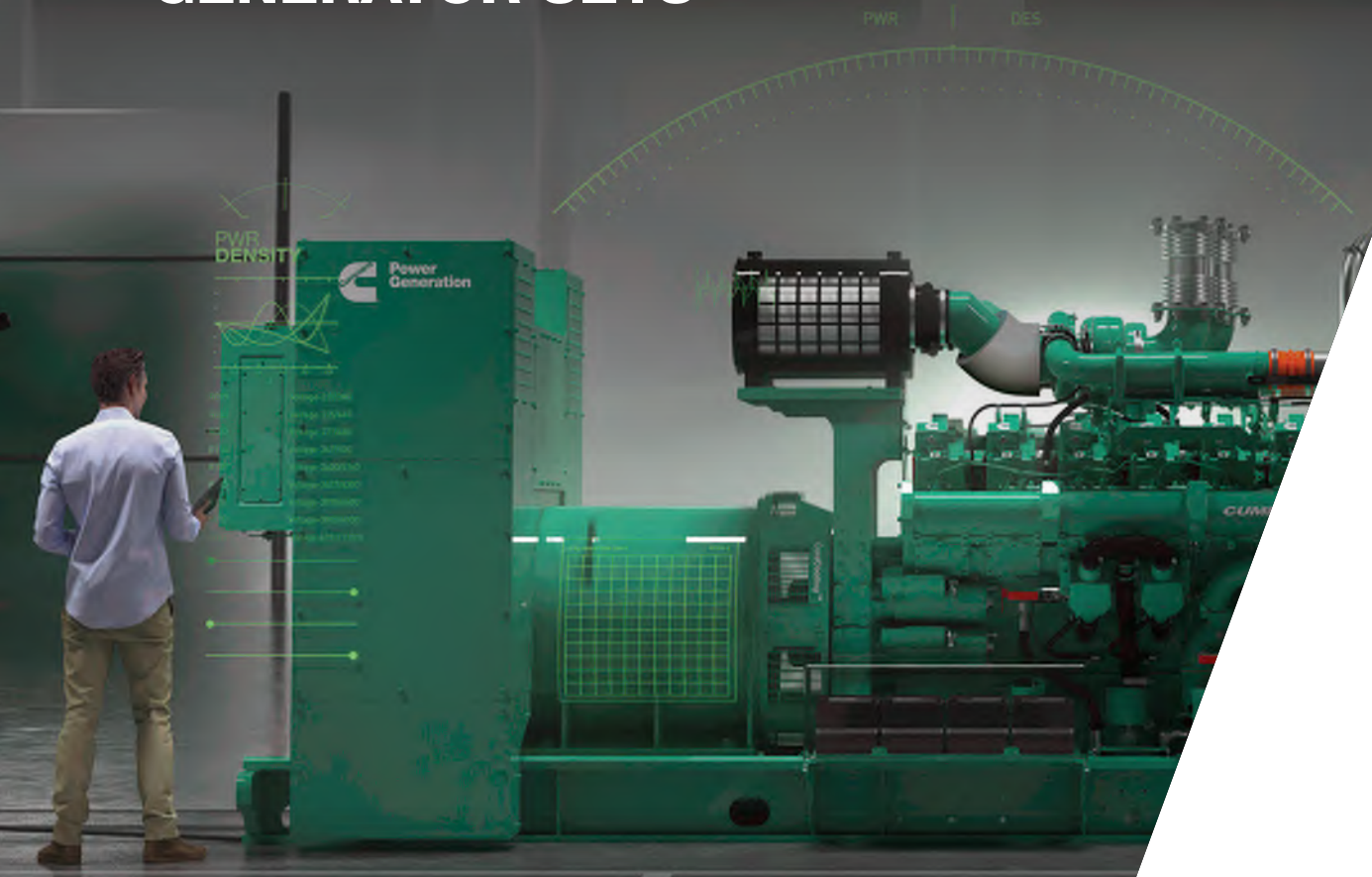


NAMEPLATE DETAIL - GENERATOR

SCALE: NONE

WELCOME TO THE NEXT GENERATION OF POWER

CUMMINS CENTUM SERIES™ C1250D6E/C1500D6E GENERATOR SETS



Cummins®

FOR A WORLD THAT'S ALWAYS ON™

INTRODUCING CENTUM™ SERIES C1250D6E/C1500D6E GENERATOR SETS

Designed to meet the demand for efficient and sustainable energy with performance, flexibility and commitment, the Centum Series is the next generation of power.

The need for power is growing, and your needs are changing. Cummins Power Generation is responding by launching the Centum Series: a new line of generator sets to meet your needs for right-sized power and reduced emissions, both today and tomorrow.

"Centum", the Latin word for "one hundred", represents both the century of Cummins Power Generation legacy behind us and our vision for the next 100 years.

C1250D6E/C1500D6E generator sets are the first release in this groundbreaking new series, which will offer a complete range of power and flexible feature sets to ensure that you get the exact power you specify — without compromises.

POWER FLEXIBILITY: YOUR NEW EDGE

Centum Series generators represent a significant shift in the Cummins approach to power system design, offering next-level flexibility, efficiency and sustainability. The Centum Series is a high-performance, high-power density system that delivers the power you need in a smaller footprint, enabling you to hit your performance specifications without requiring you to buy more than you need.

YOUR NEEDS ARE THE SPEC

With a complete spectrum of power ratings provided by new, higher-efficiency engines, you get the exact performance you need — no more, no less. Robust configuration flexibility ensures that each Centum system will meet or exceed local emissions regulations without sacrificing performance.

THE CUMMINS COMMITMENT

The Centum Series represents much more than a new approach to power system design. It's a new standard for the next 100 years of power — and a long-term commitment to you, the industry and our planet. You'll also get the rock-solid dependability Cummins is known for, encompassing the design, build, install and service by Cummins expert engineers and technicians.

AT A GLANCE

Application

Standby

kW Output

	Standby	Data Center Continuous (DCC)	Prime
C1250D6E	1250 kWe	1136 kWe	1136 kWe
C1500D6E	1500 kWe	1364 kWe	1364 kWe

Market Applications

Mission Critical

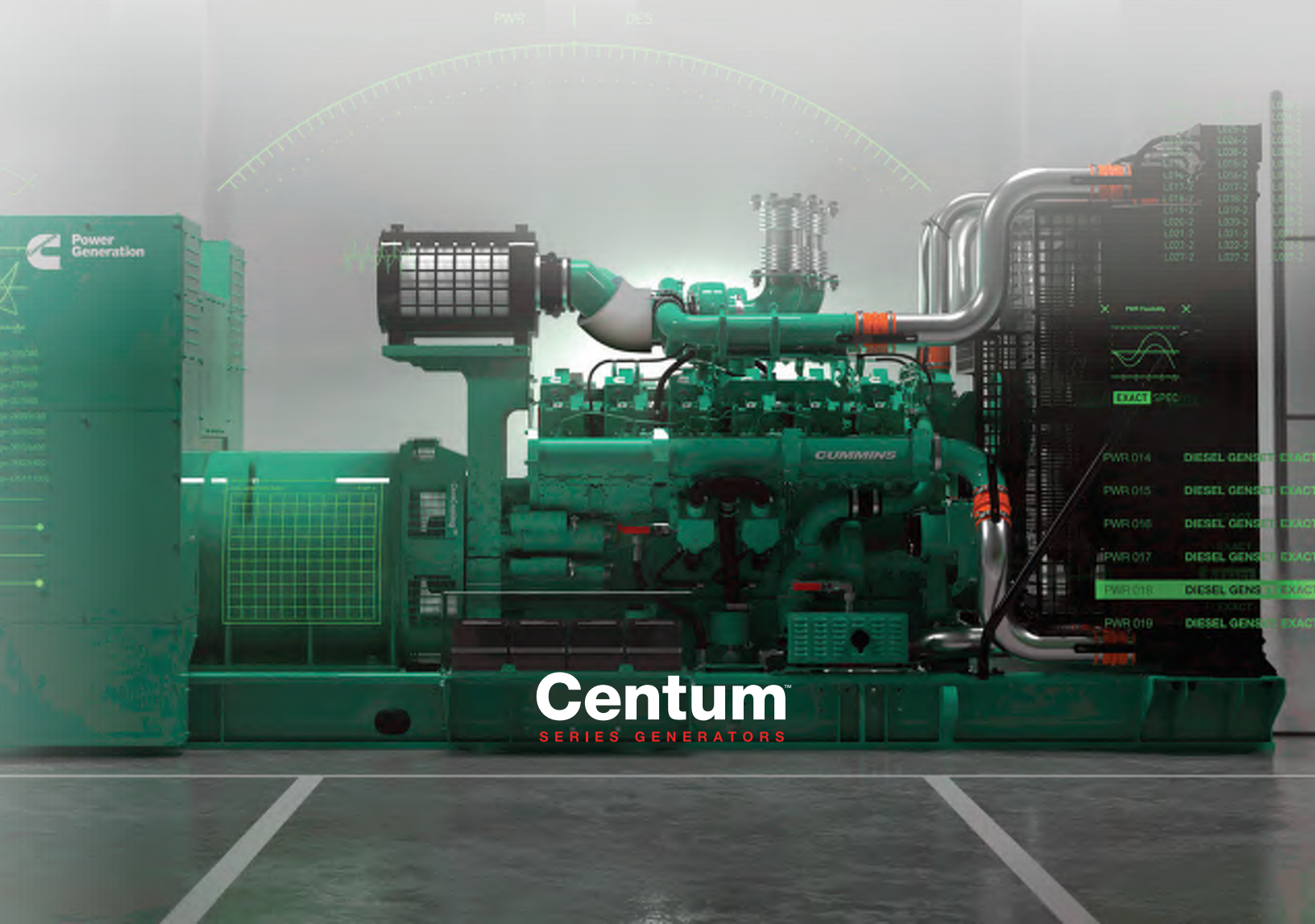
- Healthcare
- Data Centers
- Wastewater Treatment Plants

Commercial/Infrastructure

- Commercial, Retail and Hospitality
- Transportation Infrastructure
- Public and Government Infrastructure

Industrial

- Manufacturing
- Agriculture
- Others



YES, IT'S POSSIBLE TO GET EVERYTHING RIGHT.

Power Density and Flexibility

- Superior power efficiency in a smaller footprint from proven QSK38 engine
- Precisely configure your power system for your application
- Smaller equipment footprint

Lower Total Cost of Ownership

- Lower investment costs
- Easier installation
- Smaller footprint may reduce installation costs
- Lower fuel costs
- Designed from the outset for ease of service, reducing maintenance costs over the entire lifecycle

Easy Serviceability

- Every component designed for easy service
- Intelligently placed access panels for easier servicing and maneuvering

Longer Maintenance Intervals

- 500-hour minimum interval reduces maintenance shutdowns
- 2,000-hour full overhaul, providing a high return on capital expenditure investment

Compact Design

- Common chassis for all alternator configurations
- Four-point lifting arrangement of chassis enables stable lift without risking subcomponents
- Standard and enhanced integral set-mounted radiator systems simplify facility design for rejected heat

Unmatched Reliability

- S-series alternator minimizes troublesome neutral currents with low-reactance 2/3 pitch windings and low waveform distortion
- Permanent magnet generator offers enhanced motor starting and fault clearing short circuit capability
- Shielded from overloads
- Longer lifetime durability

Built for Sustainability

- Approved for use with alternative fuels, including hydrotreated vegetable oil (HVO) and other paraffinic fuels (EN15940), potentially reducing greenhouse gas (GHG) emissions by 40 to 90%
- Tier 2/Tier 4 Compliance options

Robust Transient Performance

- Recovers from large load swings quickly
- Consistent, predictable operation

High Altitude/High Ambient Performance

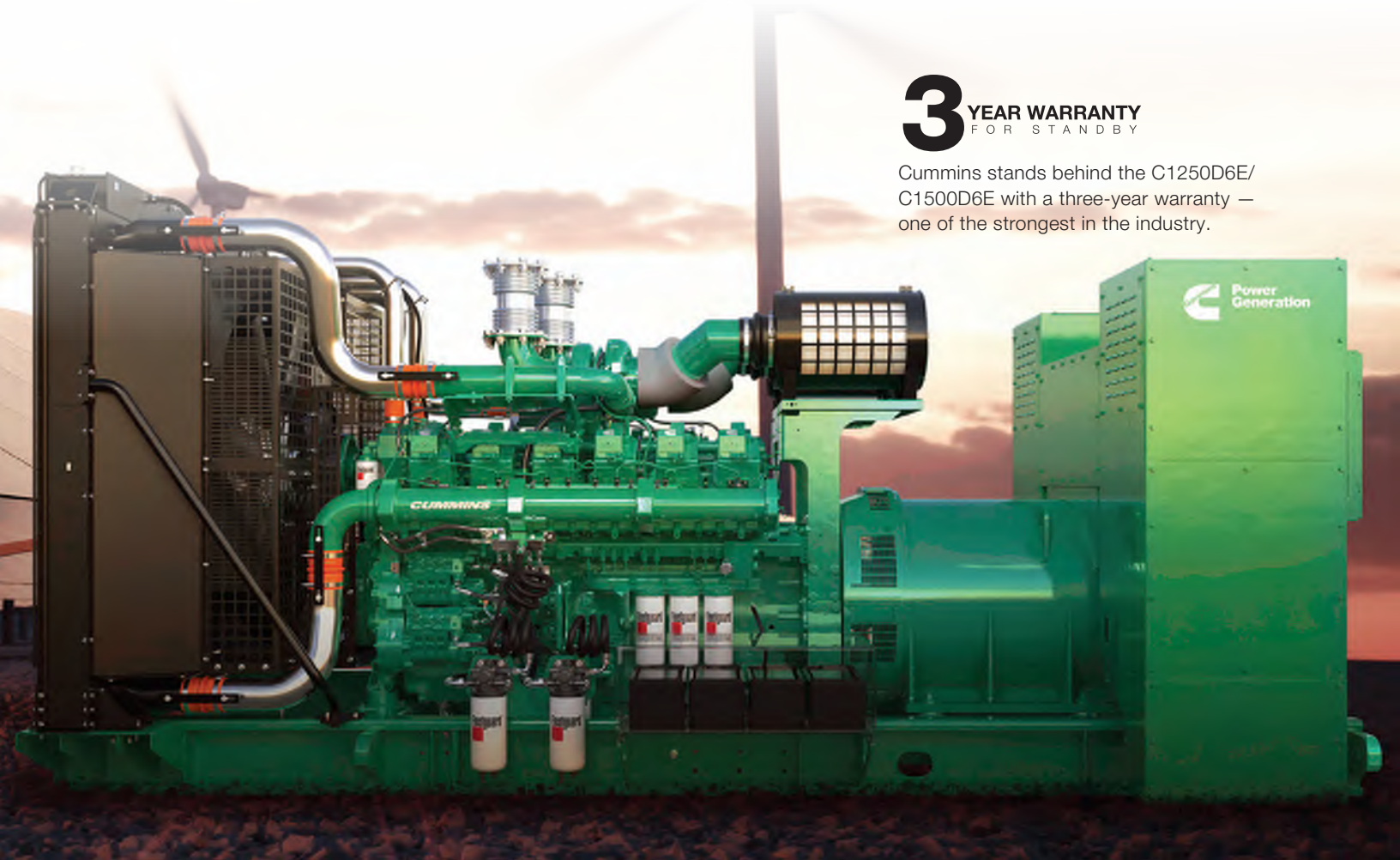
- Full power capability at high temperatures and altitudes without derating

Standard Onboard Diagnostics

- The most sophisticated predictive diagnostics in the industry
- Real-time trend data collection
- Remote monitoring facilitates maintenance in isolated locations
- Total system integration with PowerCommand® Control

3 YEAR WARRANTY
FOR STANDBY

Cummins stands behind the C1250D6E/ C1500D6E with a three-year warranty — one of the strongest in the industry.



THE COMPLETE POWER PACKAGE

There's a reason that power systems from Cummins are deployed for vital applications at some of the biggest and best-known companies and institutions in the world. Only Cummins manufactures and assembles all of the key components of its power systems. Because of this, we're able to exert the highest levels of design and performance control — resulting in a much more reliable, integrated system than any other provider in the industry. This approach reduces your system complexity and installation time while delivering maximum reliability.

Cummins innovative and comprehensive integrated power solutions go beyond generating power. Our integrated power systems enable seamless transfer of power sources and remote monitoring from wherever you are.

NEXT-GENERATION SWITCH CONTROL

PowerCommand® X-Series Transfer Switches are designed to not only match but exceed industry requirements, codes and standards. Designed for uncompromising reliability with no need for human intervention, these smarter, tougher switches enable seamless power transfers. Innovative blow-on technology — designed and patented exclusively by Cummins — enables industry-leading UL1008 withstand and closing current ratings (WCR) and short time-based ratings that give you the freedom to use any over-current protection device.

DIGITAL MASTER CONTROL (DMC)

The Cummins PowerCommand® DMC8000 is a completely customizable power system paralleling control offering integrated control solutions for complex power systems that control an unlimited number of gensets, utilities and loads for optimal power control. This built-to-order, fully customizable power controller offers more than 1,200 factory-tested failure scenarios to provide best-in-class performance, resiliency and system uptime in any potentially disruptive scenario.

REMOTE MONITORING FOR SEAMLESS CONTROL

In today's always-on world, Cummins PowerCommand Cloud™ keeps you in touch with real-time information about your power systems — wherever you are, whenever you need it. Accessed securely via your computer, tablet or smartphone, PowerCommand Cloud™ enables you to check system status, identify faults, and access critical notifications, reducing your operational and maintenance costs.

Generator set specifications

Performance Class	ISO 8528-5 G3 Capable - refer to the factory for site and configuration specific transient performance classification
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 1%
Frequency regulation	Isochronous
Random frequency variation	± 0.25
Electromagnetic Compatibility Performance	Emissions to EN 61000-6-2:2005 Immunity to EN 61000-6-4:2007+A1:2011 FCC PART 15 subpart B; ICES-002

Engine specifications

Bore	159 mm (6.26 in.)
Stroke	159 mm (6.26 in.)
Displacement	37.8 litres (2307 in^3)
Configuration	Cast iron, V 12 cylinder
Battery capacity	1800 amps minimum at ambient temperature of -18 °C (0 °F)
Battery charging alternator	100A
Starting voltage	24 volts, negative ground
Fuel system	Cummins YZ modular common rail system
Fuel filter	Two stage spin-on fuel filter and water separator system. Stage 1 has a two element 5 micron filter and stage 2 has a two element 4 micron filter.
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient cooling system

Alternator specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible disc
Insulation system	Class H
Standard temperature rise	125 ºC standby
Exciter type	Permanent Magnet Generator (PMG)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion (THDV)	< 5% no load to full linear load

Available voltages

60 Hz Line-Neutral/Line-Line

- 220/380
- 277/480
- 225/440
- 347/600
- 2400/4160
- 3637/6300
- 3810/6600
- 3983/6900
- 6350/11000

Note: Consult factory for other voltages.

Generator set options and accessories

Engine

- ✔ 240V thermo-statically controlled coolant heater
- 120/240V 500W lube oil heaters
- Heavy duty air cleaner
- ✔ Remote Duplex Fuel Filter
- ✔ Engine Oil Filters - Full Flow with Bypass
- Automatic Oil Make Up System and Monitoring
- Engine toolkit

Alternator

- ✔ 80°C/105°C /125°C/150°C rise
- Stator winding temp sensor 2 RTDs/phase
- Bearing temp sensor RTDs
- ✔ ~~1-hole or~~ 2-hole lug output terminal
- Cable entrance box set mounted top or bottom entry
- 120/240V 225W anti-condensation heater
- Generator Louvres

Control panel

- Masterless Load Demand
- Multiple language support
- ✔ 120/240V 100W control anti-condensation heater
- Exhaust pyrometer
- ✔ Ground fault indication
- Paralleling relay package
- Shutdown alarm relay package
- Mechanical hour meter
- 6x user-configurable relays
- 8 additional I/O relays

Generator set options and accessories (continued)

Exhaust system

- Industrial grade silencer
- Residential grade silencer
- Critical grade silencer

Cooling system

- Enhanced high ambient temperature (50 °C)
- ✔ Low coolant level warning
- ✔ Coolant heater

Generator set

- ✔ Oil Sampling Valve
- ✔ 10A battery charger
- Set mounted circuit breakers up to 3200 Amps
- Circuit breaker Aux and Trip contacts
- ✔ Anti-vibration mounts
- Battery temperature sensor
- ✔ IBC Certification
- HCAI Certification

Miscellaneous

- Multilingual manuals
- 3-year extended warranty
- ✔ 5-year extended warranty
- 10-year extended warranty
- Witness testing
- Virtual witness test
- Tier 4 compliant aftertreatment kits shipped loose

Note: Some options may not be available on all models - consult factory for availability.

PowerCommand 3.3 – control system

An integrated microprocessor based generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry – Includes integral AmpSentry protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power management – Control function provides battery monitoring and testing features and smart starting control system.

Advanced control methodology – Three phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications interface – Control comes standard with PCCNet and Modbus interface.

Service - InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily upgradeable – PowerCommand controls are designed with common control interfaces.

Reliable design – The control system is designed for reliable operation in harsh environment.

Multi-language support

Operator panel features

Operator/display functions

- Displays paralleling breaker status
- Provides direct control of the paralleling breaker
- 320 x 240 pixels graphic LED backlight LCD
- Auto, manual, start, stop, fault reset and lamp test/panel lamp switches
- Alpha-numeric display with pushbuttons
- LED lamps indicating genset running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop

Paralleling control functions

- First Start Sensor™ system selects first genset to close to bus
- Phase lock loop synchronizer with voltage matching
- Sync check relay
- Isochronous kW and kVar load sharing
- Load govern control for utility paralleling
- Extended paralleling (base load/peak shave) mode
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions.

Alternator data

- Line-to-Neutral and Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kW, kVAr, power factor kVA (three phase and total)

Engine data

- DC voltage
- Engine speed
- Lube oil pressure and temperature
- Coolant temperature
- Comprehensive FAE data (where applicable)

Other data

- Genset model data
- Start attempts, starts, running hours, kW hours
- Load profile (operating hours at % load in 5% increments)
- Fault history
- Data logging and fault simulation (requires InPower)

Standard control functions

Digital governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase, 4-wire Line-to-Line sensing
- Configurable torque matching

AmpSentry AC protection

- AmpSentry protective relay
- Over current and short circuit shutdown
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse Var shutdown
- Field overload shutdown

Standard control functions (continued)-

Engine protection

- Battery voltage monitoring, protection and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Full authority electronic engine protection

Control functions

- Time delay start and cool down
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop
- Data logging
- Cycle cranking
- Load shed
- Configurable inputs and outputs (4)
- Remote emergency stop

Options

- Auxiliary output relays (2)

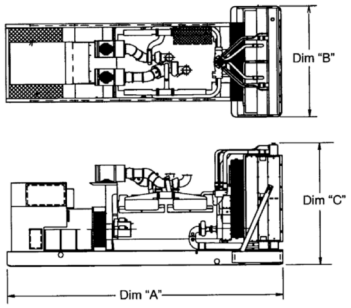
Ratings definitions

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550

Prime Power (PRP):

Applicable for supplying power to varying electrical loads for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550



This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Refer to drawings for specific weights & dimensions

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
C1250D6E	5085 (200)	2184(86)	2406(94.7)	9197 (20276)	9687 (21357)
C1500D6E	5085 (200)	2184(86)	2406(94.7)	~~9231 (20351)~~	~~9721 (21431)~~

*Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

ISO 9001	This product was manufactured in a plant whose quality management system is registered as being in conformity with ISO 9001	UL LISTED	UL Listing to UL 2200, "Stationary Engine Generator Assemblies" is available for this genset model
PTS	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.	**U.S. EPA**	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards, 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
CSA	All genset models are available as CSA certified to CSA C22.2 No. 100	**International Building Code**	The generator set package is available certified for seismic application in accordance with International Building Code

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

Centum™ SERIES GENERATORS

Specification Sheet – (07/22)

SECTION 26 32 13

ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 23 11 13 - Facility Fuel-Oil Piping:
   1. Diesel fuel piping.

C. Section 23 51 00 - Breechings, Chimneys, and Stacks: Engine exhaust piping.
   1. Includes installation of exhaust silencer specified in this section.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

E. Section 26 05 29 - Hangers and Supports for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 08 00 - Electrical Commissioning Requirements: Additional requirements for Commissioning.

H. Section 26 36 00 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. 7 CCR 1101-14 - Code of Colorado Regulations - Storage Tanks.

B. ASTM D975 - Standard Specification for Diesel Fuel 2023a.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA/EGSA 404 - Standard for Installing Generator Sets 2014.

E. NEMA MG 1 - Motors and Generators 2021.

F. NFPA 30 - Flammable and Combustible Liquids Code 2024.

G. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines 2021.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 99 - Health Care Facilities Code 2024.

J. NFPA 110 - Standard for Emergency and Standby Power Systems 2022.

K. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids Current Edition, Including All Revisions.

L. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries Current Edition, Including All Revisions.

M. UL 2200 - Stationary Engine Generator Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26 36 00.
      b. Concrete Equipment Bases.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, sub-transient reactance, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
   2. Include characteristic trip curves for overcurrent protective devices.
   3. Include alternator thermal damage curve.
   4. Include vibration isolators.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

E. Fuel Storage Tank:
   1. Calculations: Indicate maximum running time for generator set configuration provided.
   2. Low Fuel Level Warnings: Indicate set-points for fuel level warning indications.

F. Aboveground Fuel Storage Tank: Application to the Division of Oil and Public Safety for authorization to install an aboveground fuel storage tank exceeding 660 gallons.
   1. Refer to CCR 1101-14, Article 3, for specific tank requirements.

2. Completed application required no less than 20 days prior to installation of the fuel storage tank.
3. Completed registration required no less than 30 days prior to fueling.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer's factory emissions certification.

I. Compliance Form: Manufacturer's checklist and certification that products meet or exceed specified requirements.

J. Source quality control test reports.

K. Provide NFPA 110 required documentation from manufacturer, including but not limited to:
1. Certified prototype tests.
2. Torsional vibration compatibility certification.
3. NFPA 110 compliance certification.
4. Certified rated load test at rated power factor.

L. Manufacturer’s detailed field testing procedures.

M. Field quality control test reports.

N. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

O. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

P. Maintenance contracts.

Q. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.06 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

D. Source Limitations: Obtain the engine-generator and associated components specified in this section from a single manufacturer with responsibility for the entire system installation.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Provide alternate cost for five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design:
1. Cummins Power Generation Inc: www.cumminspower.com.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Diesel (compression ignition).
   2. Power Rating: As indicated on drawings, standby, including applicable derating adjustments.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Electronic trip with long time and short time delay and instantaneous pickup.
      b. Trip Rating: As indicated on drawings.
      c. Features:
         1) Auxiliary contacts.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
   1. Altitude: 6000 feet (1830 m).
   2. Ambient Temperature: Between -10 and 104 degrees F (-23 and 40 degrees C).

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Steady State Operational Bandwidth:

a. Maximum Steady State Voltage Deviation: 2 percent.
b. Maximum Steady State Frequency Deviation: 0.5 percent.

5. Maximum Load Step: Supports 50 percent of rated load in a single step.
   a. Maximum Voltage Deviation with Load Step: 20 percent.
   b. Maximum Frequency Deviation with Load Step: 5 percent.
6. Motor Starting Capability: Supports starting of motor load indicated with a maximum voltage dip as indicated under "Maximum Load Step" above.
   a. Voltage Recovery:
      1) Recover to within 90 percent of rated no-load voltage within 5 seconds.

      2) Recover to steady state voltage within 10 seconds.

   b. Frequency Recovery:
      1) Recover to steady state frequency within 5 seconds.

H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Provide 80% efficient exhaust oxidizing filter.
3. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer. Where such modifications are made, provide field emissions testing as necessary for certification.

I. Sound Level Requirements:
1. Do not exceed 54 dBA when measured at 65-feet from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.

J. Interface with building automation system (BAS).

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):
1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
2. Fuel Storage: Sub-base fuel tank.
3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
5. Sub-Base Fuel Tank:
   a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
   b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.

c. Features:
1) Direct reading fuel level gauge.

2) Normal atmospheric vent.

3) Emergency pressure relief vent.

4) Fuel fill opening with lockable cap.

5) Dedicated electrical conduit stub-up area.

6) Low fuel level switch.

7) Leak detection switch; located within secondary containment interstitial space for detection of primary tank fuel leak.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
a. Battery Type: Lead-acid.
b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
c. Recognized as complying with UL 1236.
d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
f. Provide alarm output contacts as necessary for alarm indications.
5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Sub-transient Reactance: Not greater than 12 percent at 70 percent of rated generator capacity and 14 percent at full generator capacity.

C. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

D. Temperature Rise: Comply with UL 2200.

E. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

F. Enclosure: NEMA MG 1, drip-proof.

G. Total Harmonic Distortion: Not greater than five percent.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
2. Generator Set Control Functions:
   a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
   b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
   c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
   d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
   e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
   f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
   g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
3. Generator Set Status Indications:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).
   d. Real power (W/kW).
   e. Reactive power (VAR/kVAR).
   f. Apparent power (VA/kVA).
   g. Power factor.
   h. Duty Level: Actual load as percentage of rated power.
   i. Engine speed (RPM).
   j. Battery voltage (Volts DC).
   k. Engine oil pressure.
   l. Engine coolant temperature.
   m. Engine run time.
   n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (warning).
      6) Low oil pressure (shutdown).
      7) Overspeed (shutdown).
      8) Low fuel level (warning 1) - 50% level; field adjustable.

9) Low fuel level (warning 2) - 25% level; field adjustable.

10) Low coolant level (warning/shutdown).

11) Generator control not in automatic mode (warning).

12) High battery voltage (warning).

13) Low cranking voltage (warning).

14) Low battery voltage (warning).

15) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
1) High AC voltage (shutdown).

2) Low AC voltage (shutdown).

3) High frequency (shutdown).

4) Low frequency (shutdown).

5) Overcurrent (shutdown).

6) Fuel tank leak (warning), where applicable.

c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
a. Event log.
b. Communications Capability: Utilize Modbus communications protocol. Provide all accessories necessary for proper interface.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted or surface-mounted annunciator as indicated.
2. Generator Set Status Indications:
a. Generator powering load (via position signal from transfer switch).
b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
a. Comply with NFPA 110 for Level 1 systems including but not limited to the following indications:
1) Overcrank (shutdown).

2) Low coolant temperature (warning).

3) High coolant temperature (warning).

4) High coolant temperature (shutdown).

5) Low oil pressure (warning).

6) Low oil pressure (shutdown).

7) Overspeed (shutdown).

8) Low fuel level (warning).

9) Low coolant level (warning/shutdown).

10) Generator control not in automatic mode (warning).

11) High battery voltage (warning).

12) Low cranking voltage (warning).

13) Low battery voltage (warning).

14) Battery charger failure (warning).

b. Provide audible alarm with silence function.
c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel.

C. Hardware Material: Stainless steel.

D. Color: Match CSM campus standard; PPG Autumn Brown #55-321.

E. Access Doors: Lockable, with all locks keyed alike.

F. Louvers and Openings: Screened to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Utilize an upward discharging radiator hood.

J. Exhaust Silencers: Mount within enclosure in main engine compartment.
1. Insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

K. Enclosure Lights and Switch: Vapor-proof lensed luminaires within enclosure arranged to illuminate the interior and generator controls, factory installed and wired to auxiliary power connection box.

L. Enclosure Receptacle: Convenience receptacle within enclosure, factory installed and wired to auxiliary power connection box.

M. Enclosure Space Heater: Thermostatically controlled enclosure space heater to prevent condensation and improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature and to maintain temperature above 40 degrees Fahrenheit; factory installed and wired to power panelboard.

2.07 **VIBRATION ISOLATION**

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.08 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:
   1. Operation at rated load and rated power factor.
   2. Single step load pick-up.
   3. Transient and steady state voltage and frequency performance.
   4. Operation of safety shutdowns.

D. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

B. Verify that rough-ins for field connections are in the proper locations.

C. Verify that mounting surfaces are ready to receive equipment.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized 6 inch (150 mm) high concrete pad constructed in accordance with Section 03 30 00. Provide suitable vibration isolators (spring-type), where not factory installed.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting in accordance with Section 23 11 13, where not factory installed.

I. Provide engine exhaust piping in accordance with Section 23 51 00, where not factory installed.
   1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
   2. Do not exceed manufacturer's maximum back pressure requirements.

J. Install exhaust silencer in accordance with Section 23 51 00, where not factory installed.

K. Provide grounding and bonding in accordance with Section 26 05 26.

L. Identify system wiring and components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. See Section 26 08 00 - Electrical Commissioning Requirements, for additional requirements.

C. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

D. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

E. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

F. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

G. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.

2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
3. Check for proper oil and coolant levels.

H. Prepare and start system in accordance with manufacturer's instructions.

I. Perform acceptance test in accordance with NFPA 110.

J. Inspection and testing to include, at a minimum:
1. Verify compliance with starting and load acceptance requirements.
2. Verify voltage and frequency; make required adjustments as necessary.
3. Verify phase sequence.
4. Verify control system operation, including safety shutdowns.
5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).
<<<THE FOLLOWING APPLIES TO CCSD; CONSIDER FOR OTHER PROJECTS>>>
7. Perform load tests in accordance with Owner requirements:
a. Perform a cold start test.
b. Extend NFPA 110 full load test to duration of 4 hours.
c. Perform step load pickup test.

K. Perform other test and inspections as recommended by the manufacturer.

L. Provide field emissions testing where necessary for certification.

M. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

N. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

O. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

E. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for a two year option, and separately for a five year option from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION